PB-230 807

POLLUTION OF LAKE ERIE AND ITS TRIBUTARIES. PROCEEDINGS OF CONFERENCE HELD AT CLEVELAND, OHIO ON AUGUST 3-6, 1965. VOLUME 2

Public Health Service
Washington, D. C.

6 August 1965

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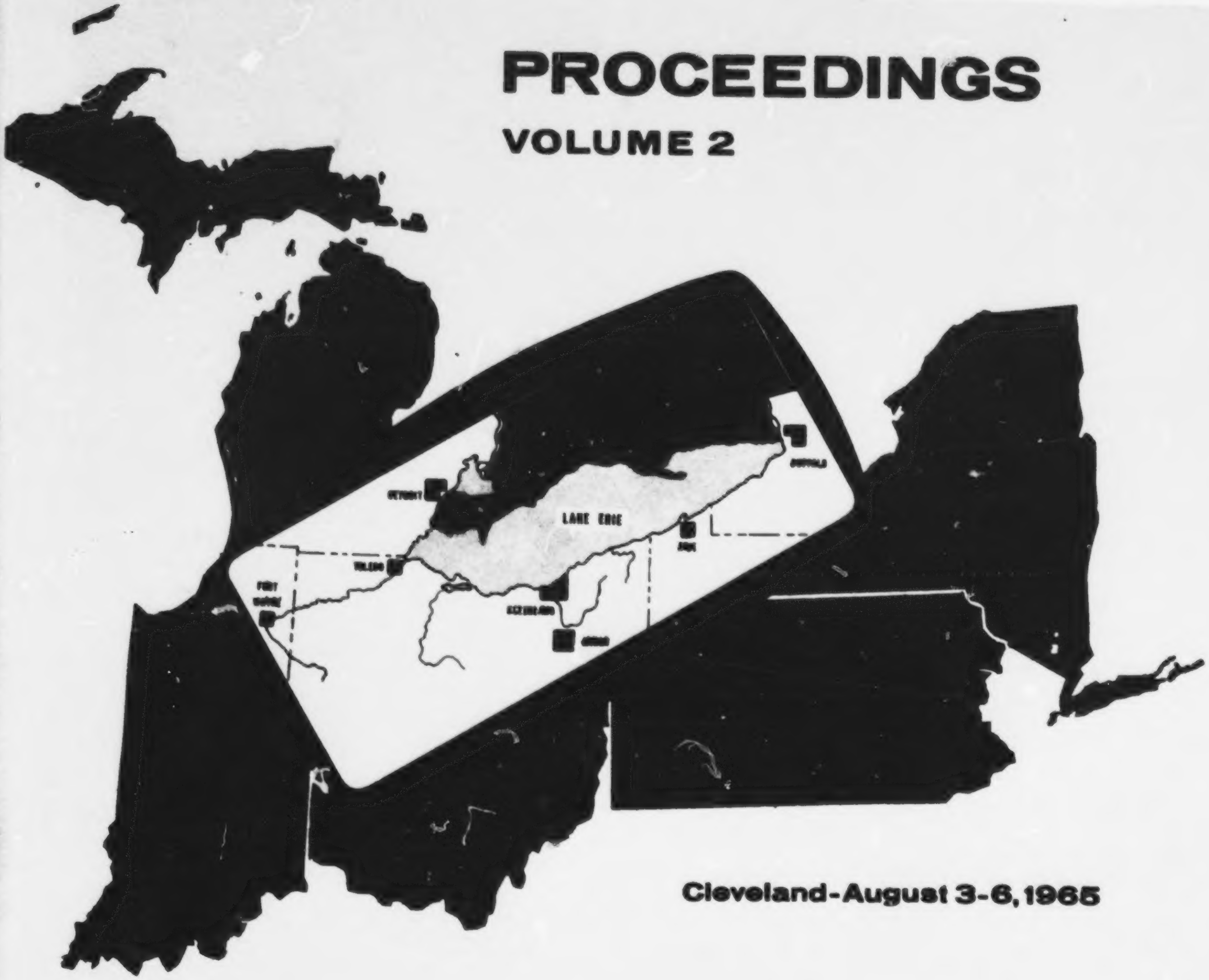

PROCEEDINGS

VOLUME 2

Cleveland-August 3-6, 1965

Conference

In the matter of Pollution of Lake Erie and its Tributaries

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Stephen Megregian

Economic Aspects

Although the Cuyahoga Basin contains only three per cent of the land in the Lake Erie Basin, its 1.9 million people represent nineteen per cent of the total population. Forty-nine municipalities wholly or partly within the basin contribute heavily to this total. A steady growth pattern since 1900 indicates that by the year 2000 the population will have climbed over three million. Cleveland and Akron are the principal cities with populations of 876,000 and 290,000, respectively.

The economic growth expected within the basin should follow the increasing population.

The Cleveland area is one of the greatest steel producing and fabricating areas in the world, and Akron supplies 75 per cent of the world's rubber tire needs. In addition to these two industries, automotive manufacturing and chemical industries play a large role in the economy of the basin. These industries account for over 225,000 jobs. There are more than 65 industries operating within the Cuyahoga Basin and along the adjacent lakefront.

Cleveland is a major Great Lakes shipping port with well developed dock and storage facilities.

The principal commodities handled are iron ore, coal, sand, gravel, and limestone.

Water Uses

Municipal

From its headwaters downstream to Lake Rockwell, the Cuyahoga River supplies 50 mgd to the city of Akron's filtration plant. At Cuyahoga Falls, the only other municipal user, the river recharges a well water supply system during periods of high flow.

Industrial

In the upstream portion of the basin, industrial well fields tap underground supplies 18 mgd at Akron, Cuyahoga Falls, and Kent. Surface water meets another 200 mgd industrial demand in this area. Between Akron and the navigation channel in Cleveland, 120 mgd are withdrawn for varied manufacturing purposes.

Water supplied from the navigation channel is 300 mgd, but this cannot be directly attributed to river yield since the water levels in this section are determined by lake elevations.

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Waterborne Commerce

The Corps of Engineers, U. S. Army, reported that in 1962 over 16 million tons of cargo moved through the port of Cleveland. Iron ore and related materials for the steel industry, petroleum products, and materials for the chemical industry were the major types of cargo shipped through Cleveland.

Recreation

The upstream sections of the river are used for fishing and boating. This area supports many species of fish. Below Lake Rockwell, the species of fish become less desirable and the quantities decrease. Reaches of the river below Akron are unsuitable for all types of water recreation.

Along the Cleveland metropolitan lakefront there are 10 public beaches and several boat marinas. The city has adopted a "swim if you must" bathing beach policy, because of the high coliform densities in the nearshore zone.

Rural

In rural areas, the primary water supplies are drilled wells. Most of the farms support dairy herds.

Water used for irrigation is negligible.

Esthetics

Debris-filled, oil-slicked, dirty-looking waterways defines the Cuyahoga River at any place along its course. Some reaches are blocked completely by dead trees and stumps, while the banks are dotted with many small dumps. Trash ranging from tin cans to refrigerators is a common sight in the river. In the navigation channel where the Cuyahoga flows through Cleveland even more debris exists and the water surface often becomes black with oil from the industrial outfalls. As long as these situations remain, the Cuyahoga will be a liability to the cities it serves and adjacent property owners, instead of an asset.

The lakefront is littered with debris. The discolored water and floating debris, particularly behind the Federal breakwater, have reduced the esthetic value usually associated with the free, limitless beauty of a natural body of water. The debris consists of discarded lumber, tree limbs, metal cans, paper products, dead fish, oil slicks, grease, and scum.

Stephen Megregian

Sources of Wastes

Thirty-five sewage treatment plants discharge to the Cuyahoga River. There are 1,124,000 PE served by 33 secondary treatment plants and 29,000 people served by 4 primary plants. Thirty-five thousand people are not served by any central treatment plant at all.

Cleveland's Southerly Sewage Treatment Plant and Akron's Water Pollution Control Station, which together treat the wastes from 1,000,000 PE, have been classified inadequate by the Ohio Department of Health. Of the 41 industries located within the basin, 19 have inadequate treatment facilities, according to the Ohio Department of Health.

The average daily loads to the navigation channel at Cleveland are as follows: 80,000 lbs./day BOD; 3,500 lbs./day phosphate; 42,500 lbs./day ammonia nitrogen; 9,100 lbs./day nitrate-nitrogen; and 104 lbs./day phenols.

There are three large sewage treatment plants that discharge directly to the Lake along the Cleveland waterfront.

There are 1,000,000 people served by the Cleveland Easterly Plant (secondary treatment) and 364,000 people served by the primary sewage treatment facilities of Cleveland Westerly and Euclid.

Most industries in the lakefront area discharge to sanitary sewers. There are two industries under permit to the State of Ohio to discharge directly to the Lake or to the small streams which drain eastern Cleveland. However, there are 20 known industries that discharge to the Greater Cleveland Lakefront. The pollutional significance of these discharges has not been determined.

A substantial portion of the City of Cleveland is served by a combined sewer system. With the construction of sewage treatment plants, combined sewers were connected to new interceptor sewers to collect the dry weather flow with some allowance for storm waters. Overflow structures were provided at most junctures between the combined sewers and the interceptor so that heavy stormwater flows would discharge directly to the nearest water course.

The City of Cleveland has approximately 383 combined sewer overflow structures which discharge sewage and industrial wastes mixed with storm water during periods of storm runoff. There are more than one hundred and thirty storm water overflow devices that discharge to the Lake or small streams in eastern

Cleveland. Over two hundred and fifty additional overflow devices discharge to the Cuyahoga River or small tributaries. A number of these overflow structures are continually malfunctioning and contribute a significant amount of sewage to the lakefront area.

Effects of Wastes on Water Quality and Water Uses - Cuyahoga River

DO-BOD Relationships

The dissolved oxygen concentration was critically low below Kent, Akron, and in the navigational channel in Cleveland. During 1964, oxygen concentrations downstream from Kent's sewage treatment plant ranged from a high of 9.25 mg/1 in the winter to a low of 0.05 mg/1 in the summer. The DO below Akron's water pollution control station varied from 0.45 to 5.85 mg/1. In the navigation channel which is below Cleveland's Southerly Treatment Plant and amid the industrial complex, values ranged between zero mg/1 and 1.20 mg/1. The five-day biochemical oxygen demands (BOD) averaged 10.2 mg/1, 11.30 mg/1 and 8.9 mg/1, respectively, for these areas. Bottom dwelling animals were limited to midge larvae and sludgeworms in this section at the mouth of the river.

Dugway Brook and Nine-mile Creek were sampled several times in 1963 and 1964 and showed indications of pollution. The dissolved oxygen was generally zero and the BOD varied from 9 to 30 mg/l.

Phenols

In 1964 phenol concentration increased from Lake Rockwell to Lake Erie. The concentration averaged 1.8 micrograms per liter at Lake Rockwell, 7.2 micrograms per liter at Akron, and 20.8 micrograms per liter at Cleveland during the summer of 1964. In the navigation channel, phenol averaged 58.0 micrograms per liter and the maximum was 175 micrograms per liter.

Algae and Aquatic Plants

In the impounded waters above Kent, and between Kent and Akron, there are prolific growths of algae and aquatic weeds which create a nuisance condition and degrade the esthetic value of the river. Decomposition of these growths which are nourished by the effluents from the sewage treatment plants of Ravenna, Kent, and Stow exert an oxygen demand on the river.

The waters flowing from Lake Rockwell support a clean water community of bottom dwelling animals. Below Kent the population shifts to the pollution-tolerant forms. Only pollution-tolerant forms were found between Kent and the lower river. In the lower Cuyahoga conditions were so severe that even the most tolerant forms were totally absent.

Microbiological

Excessive bacterial pollution of the Cuyahoga exists from its headwaters to its mouth. Median total coliform values per 100 ml ranged from a low of 9,200 organisms at Lake Rockwell to a high of 470,000 organisms at the head of the navigation channel. The fecal coliform to fecal streptococcus ratio varied from 1:1 to 10:1, indicating pollution from human origin. The human enteric pathogen study conducted in the Cleveland area showed 14 different species of Salmonella organisms. Salmonella was detected in 65 per cent of the samples. These observations confirm the health hazard to humans contacting these highly polluted waters.

Debris and Oil

The fallen trees, trash, and debris make the waterway unsightly and unusable at many locations. Removal of this foreign material would permit more extensive boating in the upper reaches. The debris along the lakefront detracts from the natural beauty of Lake Erie and is hazardous to the many boaters on the Lake.

The oil on the surface of the river throughout the navigation channel has fueled some large fires in the lower river. The problem has reached such proportion that fire breaks have been built to separate the surface waters into sections so that oil fires can be held within a certain area.

Effects of Wastes on Lakefront Water Quality and Water Uses

The breakwater acts as a holding basin for Cuyahoga River water. Depending on wind direction, water flows out of the breakwater through either the north or east outlets. Water within this basin tends to be of uniformly poor quality with relatively higher concentrations of chemical and microbiological pollutants nearer the river mouth.

At the river-Lake junction, dispersion or dilution of river water takes place. The dissolved oxygen values approach saturation, and other substances approach background concentrations of the Lake. Conductivity values show no appreciable concentration gradients one-half mile beyond the breakwall.

Stephen Megregian

The coliform concentrations decreased from a median of 470,000 organisms per 100 ml at the head of the navigation channel to about 5,000 per 100 ml at the mouth of the breakwall. All stations inside the breakwater exhibited a very limited variety of tolerant bottom animals. Only sludgeworms, fingernail clams, nematodes, and bloodworms were found in this area. Sludgeworms, which thrive on organic matter, averaged 400,000 per square meter in the harbor. Outside the breakwater a slightly more diverse fauna was found which included less tolerant leeches, pulmonate and gill-breathing snails, and aquatic sowbugs in addition to the forms found inside the breakwater. No sensitive mayfly nymphs, caddis fly larvae, scuds and unionid clams were found at any of the stations sampled. The bottom type, depth, and temperature here are suitable for all of these intolerant groups, and they occur under similar conditions in other parts of Lake Erie.

The U. S. Corps of Engineers routinely dredge the shipping channels in Cleveland Harbor and the Cuyahoga River. The material dredged from these areas until recently was deposited about eight miles out in the Lake but is now deposited on an experimental basis near the north side of the east breakwall. A narrow band microbiologically polluted water exists along the shore and behind the breakwater. There is a sharp break between this band and the offshore waters, rather than a gradual dispersion. Thus a condition exists where the beach areas are highly polluted, while the water a distance of one-half mile from shore is suitable for recreation and other purposes.

The results of a microbiological study of bathing beach areas this past summer by the Cities of Cleveland and Euclid and the Public Health Service are summarized below. Median values are recorded in this table. These data show the high counts observed on all beaches and these beaches all remained open during the study period.

BATHING BEACH STUDY
CLEVELAND LAKEFRONT

City	Beach	Median	Total Coliform Count % greater than 1,000/100 ml
Cleveland, Ohio	Perkins	3,400	65%
Cleveland, Ohio	Edgewater	5,000	76%
Cleveland, Ohio	White City	6,100	91%
Cleveland, Ohio	Wildwood	700	40%
Euclid, Ohio	E. 199 Street	7,400	92%
Euclid, Ohio	E. 215 Street	9,200	90%
Euclid, Ohio	E. 222 Street	12,000	86%
Euclid, Ohio	E. 225 Street	12,000	86%
Euclid, Ohio	E. 252 Street	6,100	78%
Euclid, Ohio	Lloyd Road	4,000	82%

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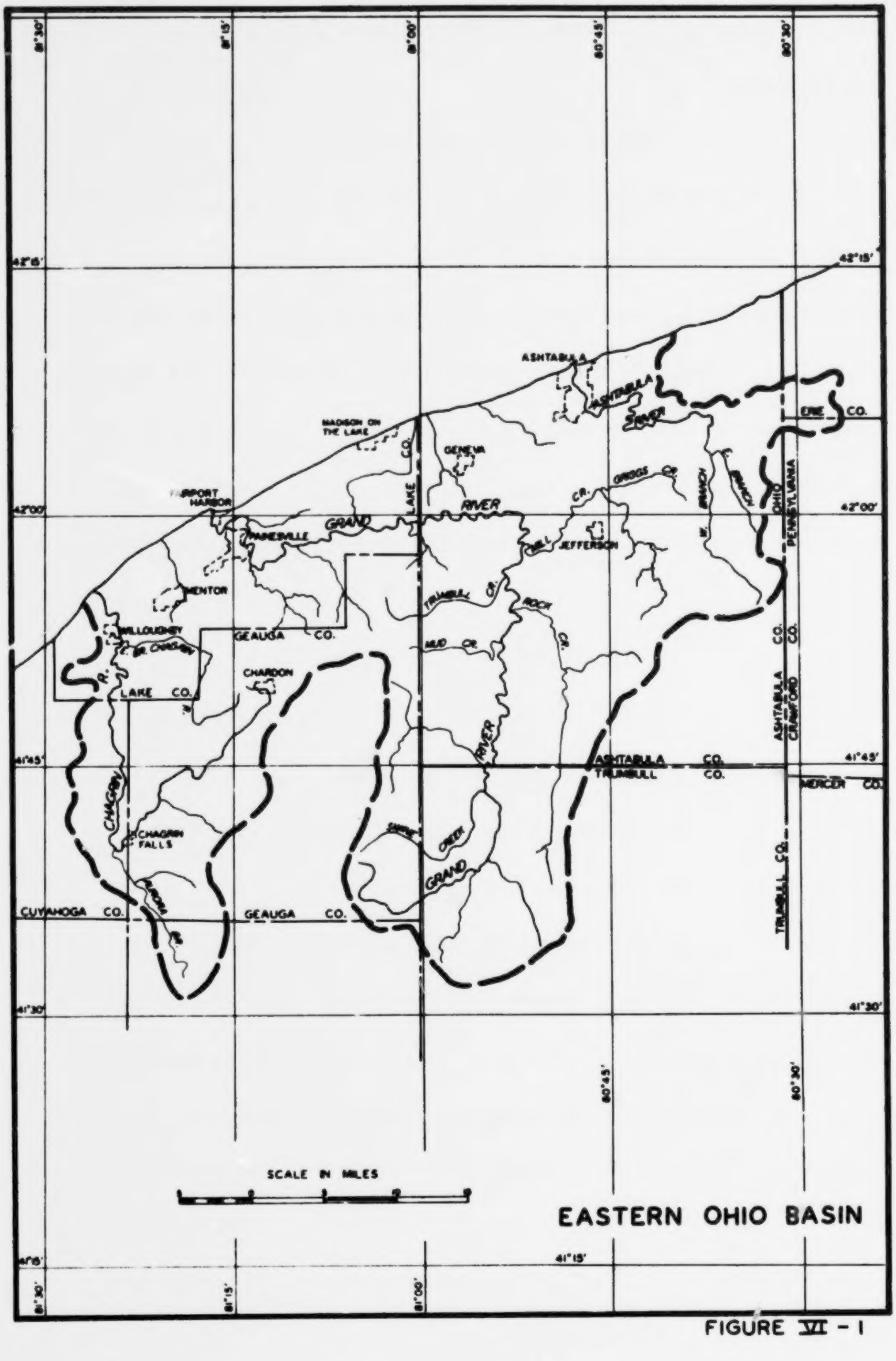
EASTERN OHIO

Area Description

The principal tributaries to Lake Erie in Northeastern Ohio are the Grand River, Ashtabula River, and Conneaut Creek. The combined drainage basins cover an area of 1,208 square miles, of which 86 per cent is rural. The population of 180,000 is concentrated along Lake Erie and in Lake County. Manufacturers of chemical and allied products and other diversified industries are found near the mouth of the three major streams. The ports of Fairport Harbor, Ashtabula and Conneaut, at the mouth of the three major streams, handle 11 per cent of Lake Erie commerce. Dairying, greenhouses, and nurseries are prominent agricultural pursuits in the basin.

(Figure VI-1 follows.)


81°30'
81°15'
81°00'
80°45'
80°30'
42°15'
42°00'
41°45'
41°30'
41°15'
ASHTABULA
ASHTABULA
RIVER
ERIE CO.
MADISON ON THE LAKE
GENEVA
FAIRPORT HARBOR
PAINESVILLE
GRAND
RIVER
LAKE CO.
GRIGGS CR.
W. BRANCH
E. BRANCH
OHIO
PENNSYLVANIA
JEFFERSON
MENTOR
TRUMBULL CR.
ROCK CR.
WILLOUGHBY
E. BR. CHAGRIN
R.
GEAUGA CO.
LAKE CO.
CHARDON
MUD CR.
RIVER
ASHTABULA CO.
CRAWFORD CO.
ASHTABULA CO.
TRUMBULL CO.
MERCER CO.
CHAGRIN
CHAGRIN FALLS
SWINE CREEK
GRAND
AURORA BR.
CUYAHOGA CO.
GEAUGA CO.
TRUMBULL CO.
SCALE IN MILES
0 2 4 6 8

EASTERN OHIO BASIN

FIGURE VI - 1

Stephen Megregian

Water Uses

Municipal Water Supply

Lake Erie provides 83 per cent of the municipal water supply in the Basin. Only two communities, Geneva and Jefferson, withdraw municipal water from inland surface streams. These communities located in the Grand River Basin, withdraw 0.9 mgd from the Grand River and 0.25 mgs from Mill Creek, respectively. Only 1.43 mgd of municipal water supplies are taken from ground water.

Industrial Water Use

Industrial water use in the Northeastern Ohio Basin totaled 290 mgd in 1955 and water used in power generation (exclusive of hydroelectric power) totaled 540 mgd. Primary metal industries used 180 mgd, 60 per cent, chemical and allied products industries used 109 mgd, 37 per cent total. Lake Erie furnished 98 per cent of the industrial water use. Sixty-six per cent was used by industries at Fairport Harbor. The major industrial water supply withdrawn from surface streams was taken from the Grand River at the city of Grand River. Cooling water accounted for 93 per cent of industrial water usage.

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Shoreline Recreation

The five main shoreline recreation areas in Lake County are Mentor Township Park, Headlands State Park, Fairport Beach, Painesville Township Park, and Madison Township Park. These beach areas are used for swimming, boating, water skiing, and fishing. These beaches serve the people of Cleveland and its suburbs as well as local residents. This area has partially replaced the Cleveland lakefront as a recreation center.

In the summer of 1964, the Lake County Health Department conducted a study of these five beach areas. The median coliform densities ranged from 130 to 1,000 organisms per 100 ml at Headlands State Park and Painesville Township Park, respectively. It was found in many cases that the coliform density increased during periods of rainfall and high or gusty winds.

Principal Sources of Waste

A total of 113,000 population equivalents (PE) of municipal waste is treated by 10 secondary and 11 primary sewage treatment plants. Of this total, 94,000 PE are treated by facilities tributary directly to Lake Erie. Approximately 38,000 people use septic tank disposal systems.

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Principal discharges directly to Lake Erie are from the lakefront communities of Ashtabula and Conneaut and from two Lake County sewer districts. All employ primary waste treatment.

All inland and upstream municipal discharges, except in Fairport Harbor and Painesville, are minor because of small population centers, secondary treatment, or discharge to the ground.

Data on the discharges of industrial wastes to the Eastern Ohio tributaries are not complete. From partial data obtained from the Ohio State Department of Health, 19 principal industrial discharges have been tabulated.

Chemical industries of the Basin are engaged in processing sodium chloride and related products, and primary metals such as titanium and aluminum. They discharge an undetermined amount of chloride, metals, and other chemicals to the surface streams.

Except for chemical industries, the only major water user is a synthetic textile plant, the Industrial Rayon Company, which discharges its wastes to Lake Erie. The flow reported for this industry is 3.5 mgd and the discharge contains approximately 20 tons/day of total solids, 800 pounds per day of BOD, along with metals, oil, and other chemicals.

Waste discharges from metal finishing operations in the Basin are minor in flow quantities, compared to the chemical and synthetic textile industries, but improperly treated wastes are extremely toxic. They consist of acid and alkaline cleaning compounds, cyanide, chrome, and other heavy metals. The industries discharge to minor tributaries of Lake Erie where little flow is available for dilution.

Grand River

Three municipal treatment plants provide primary treatment for 19,500 PE, and three plants provide secondary treatment for 6,000 PE in the Grand River Basin. A total of 6,800 people in 14 communities are not served by collection and treatment systems.

Six major industries also discharge to the Grand River. These are: Diamond Alkali Company; Calhio Chemicals; Naugatuck Chemical; Metal Craft Company; A. E. Staley Manufacturing Company; and Welded Tubes, Incorporated.

In addition to process chemicals, the major contributions of these industries are chlorides and solids. The industrial waste data are inadequate to make an estimate of the loads contributed by these industries.

It is estimated that 94 mgd of the industrial water is returned to the Grand River, approximately 83 per cent is used as cooling water.

Ashtabula River

There are no sewerage systems discharging to the Ashtabula River. A total of 1,100 people in three Ohio communities have no central treatment. The City of Ashtabula treats 16,000 PE with primary treatment and discharges to Lake Erie.

Nine major industries discharge to Fields Brook which is tributary to the Ashtabula River in the City of Ashtabula. These industries are: Olin Mathieson; Cabot Titania Corporation Titania Dioxide Plant; Titania Tetrachloride Plant; Detrex Chemical Industries, Chlorinated Solvents Division; Reactive Metals Sodium and Chlorine Plant; Reactive Metals Metal Reduction Plant; Reactive Metals Extrusion Plant; Diamond Alkali Company; and General Tire and Rubber Company, Chemical Division.

Conneaut Creek

Four municipal treatment plants, all in

Pennsylvania, provide secondary treatment for 2,400 PE and discharge to Conneaut Creek. Five communities (7,200 people) are not served by sewerage systems. Two communities (5,100 people) are in Ohio and the three communities (2,100 people) are in Pennsylvania.

One major industry, Albro Packing Company in Springboro, Pennsylvania, is located in the Conneaut Creek basin.

Total Loads to Lake Erie

The load contributed by the Grand River, as measured bi-weekly for one year at 2.3 miles above the mouth, is presented below.

	Average Pounds per Day
Chlorides	2,200,000
Biochemical Oxygen Demand	7,000
Phenols	75
Nitrogen Compounds	3,970

The actual load to Lake Erie is greater because an undetermined quantity of industrial wastes is discharged to the river below this sampling station. The flow could be as great as 100 mgd.

Stephen Megregian

Loads from the Ashtabula River at the sampling station 3.3 miles from the mouth are as follows:

	Pounds per Day
Chlorides	17,000
Biochemical Oxygen Demand	13,000
Phenols	1
Phosphate	55
Nitrogen Compounds	310

Again, the actual load to Lake Erie is greater because an undetermined quantity of industrial wastes is discharged to this river below this sampling station.

Effects of Wastes on Water Quality

Grand River

The lower three miles of the river are brightly colored, with hues ranging from bright green and yellow to black. The green and yellow colors result from chemical discharges, but the black color is attributed to fly ash discharges. The banks of the river in this reach are covered with a white sediment, from chemical discharges.

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Chloride concentrations of 3,620 mg/l and 5,260 mg/l were found during the summer and fall of 1964, respectively, at mile point 2.3. This station is below the discharges of several large chemical industries. Above these industrial discharges the chloride concentrations were 40 mg/l and 44 mg/l, respectively.

The degradation of the Grand River is objectionable because the polluted water flows through an expanding urban area at the river mouth. The same sediments that were found along the river bank were also found on the sides of pleasure boats.

Coliform densities, less than 1,000 per 100 ml at the mouth of the river, do not indicate a health hazard. No dissolved oxygen problems were found in the chemically polluted Grand River and the highest seasonal BOD was only 5.0 mg/l. Median total coliform densities were found to be below 10,000 per 100 ml except immediately below the Fairport Harbor and Painesville sewage treatment plants where the median values were 67,000 and 150,000 per 100 ml during the summer and fall, respectively.

Between Painesville and the river mouth bottom dwelling organisms were limited to pollution-tolerant sludgeworms and bloodworms.

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Ashtabula River

Above the city, the lowest dissolved oxygen concentration found was 6.6 mg/l and BOD averaged less than 2.9 mg/l. Median coliform densities in summer and fall were under 7,900 per 100 ml and under 750 per 100 ml in the winter and spring.

Median coliform densities of 43,000 and 250,000 per 100 ml were found at mile point 0.7 during the summer and fall.

The chemical and allied products industries at Ashtabula discharge their wastes into a large marshy area of Fields Brook creating a severe problem.

The dissolved oxygen concentration at mile point 2.3 was below 4 mg/l 25 per cent of the time during the summer, the lowest was 1.2 mg/l. The BOD average was 10 mg/l during October and November. Both of these conditions were obtained during the extremely low flow, 7 cfs, during the summer and 3 cfs during October and November.

Conneaut Creek

The only municipal waste discharges to Conneaut Creek are two secondary treatment plants in Pennsylvania which discharge only a total of 60 pounds of BOD per day.

A meat packing operation at Springboro, Pennsylvania, discharges approximately 140 pounds of BOD per day from a secondary treatment plant.

Effects on Lake

The effect of the Grand River on Lake Erie is noticeable up to two miles from shore. Sampling data indicate that there is density stratification as it enters the lake. Chloride concentrations which are high in the river averaged 107 mg/l at the entrance to the harbor and 40 to 50 mg/l outside the breakwall at the upper layer.

The Ashtabula River exerts an influence on the Lake as far as 1.5 miles from the river mouth, as evidenced by coliform levels. The median total coliform densities decreased from 41,000 to 150 per 100 ml. Offshore from Ashtabula, total coliform values in Lake Erie were less than 1 per 100 ml 60 per cent of the time. Within the harbor, median coliform densities were below 1,500 per 100 ml.

A median coliform value of 2,800 per 100 ml was found at the station offshore from the Ashtabula Sewage Treatment Plant.

The bottom dwelling animals outside of the harbor were similar in both number and kinds to adjacent inshore areas and no evidence of the River's effect could be determined more than half a mile from the mouth.

Generally, the waters of Lake Erie beaches in eastern Ohio are of satisfactory bacterial quality.

DETROIT RIVER AND MICHIGAN TRIBUTARIES

Pollution of the Detroit River and Michigan waters of Lake Erie has been the subject of previous enforcement conferences. Specific recommendations were developed by the Detroit River-Lake Erie Project for all known sources of municipal and industrial wastes in the conference area. At the conference session held June 15-18, 1965, the Michigan Water Resources Commission agreed to implement the recommendations of the U. S. Department of Health, Education, and Welfare, as contained in the "Report on Pollution of the Detroit River, Michigan Waters of Lake Erie, and their Tributaries," April 1965.

The material in this chapter is an abstract of the "Summary, Conclusions and Recommendations" volume of that report.

MR. STEIN: Mr. Megregian, since the Detroit River is the subject of another conference, and this is an abstract of a record already made, I wonder if, in the interests of time, could you just put this into the record?

MR. MEGREGIAN: That is entirely up to you.

MR. STEIN: May I suggest we do that, and this will appear as if read in the record, because this has already been discussed.

MR. MEGREGIAN: All right.

(The following is a continuation of Chapter VII of the report:)

Description of the Area

The Detroit River, the Huron River, and the Raisin River are the principal Michigan tributaries to Lake Erie. The Detroit River is the connecting waterway between Lake St. Clair and Lake Erie, and is the International Boundary between the United States and Canada. The Detroit River flows in a southwesterly, then a southerly direction for about 31 miles from Windmill Point to its mouth at Lake Erie. The major tributary to the Detroit River is the Rouge River which discharges at Zug Island. The Huron River begins west of Detroit and flows in a southwesterly, then a southeasterly

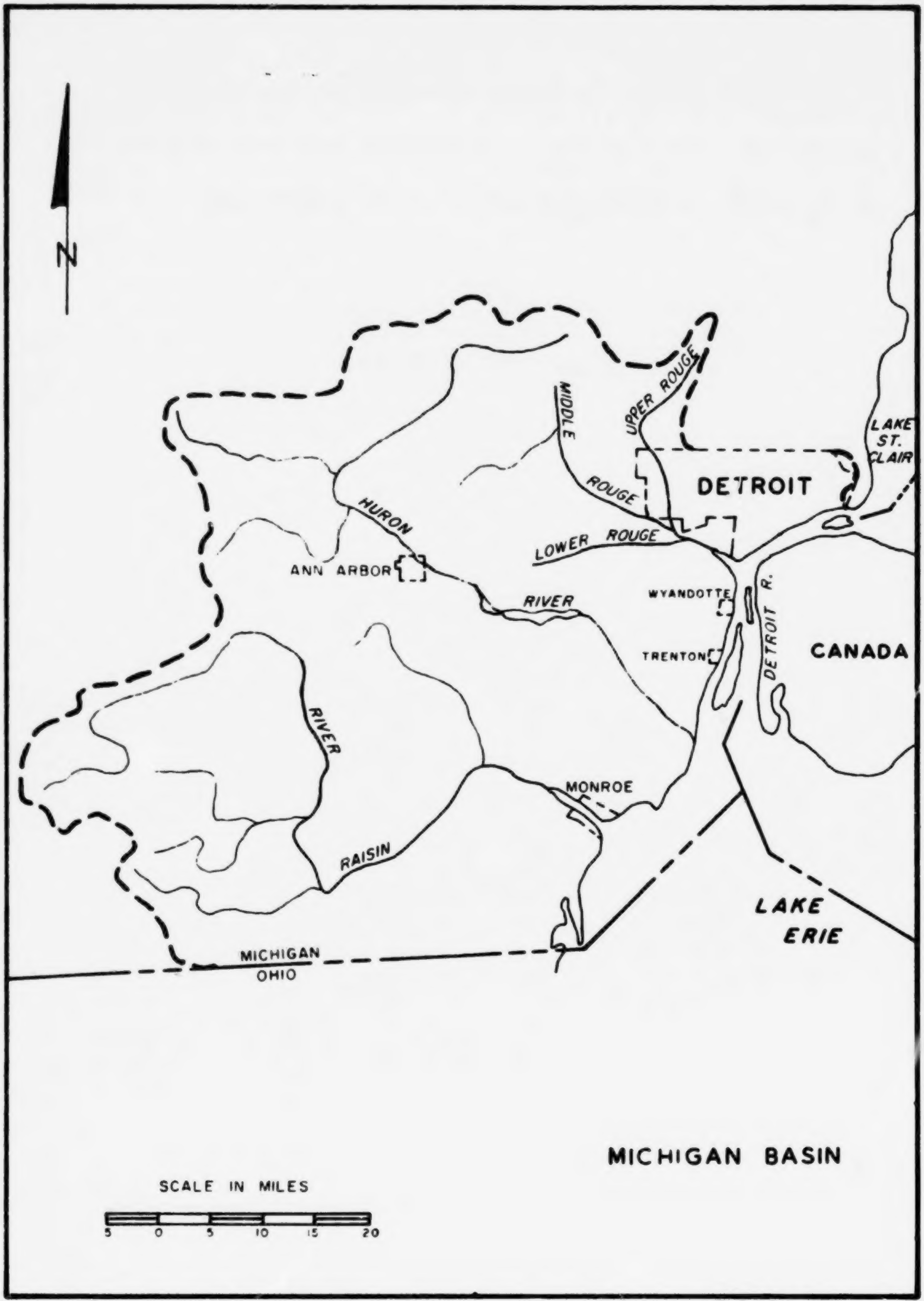
Stephen Megregian

direction to its mouth at Pointe Mouilee near the mouth of the Detroit River. The Raisin River begins about 50 miles due west of Monroe and discharges to Lake Erie just below Monroe.

The Detroit River, outstanding among great waterways of the world, performs a number of important functions for the area. It provides a shipping channel for the heavy traffic through the Great Lakes, provides vast quantities of water for municipal and industrial purposes, and receives large volumes of untreated and partially treated sewage and industrial wastes. The Detroit River also provides, potentially, excellent opportunities for recreation.

The Detroit, Huron, and Raisin River Basin has a population of over 3.8 million people and a drainage area of 2,000 square miles. This area serves three important economic functions: agriculture, industry, and recreation. The inland area of the basin as well as the land bordering the western edge of Lake Erie is used for farming and recreation. There are at least 18 recreational areas and 63 marina facilities located along the Detroit River and the Michigan portion of Lake Erie. The Detroit area has developed into one of the most important industrial centers in the world. The automobile industry has been responsible for the rapid industrial growth in the Detroit area over the past 30 to 40 years, bringing in many related industries.

(Figure VII-1 follows.)


N
UPPER ROUGE
MIDDLE ROUGE
LAKE ST. CLAIR
DETROIT
HURON
LOWER ROUGE
ANN ARBOR
RIVER
WYANDOTTE
DETROIT R.
TRENTON
CANADA
RIVER
MONROE
RAISIN
LAKE ERIE
MICHIGAN
OHIO
SCALE IN MILES
5
0
5
10
15
20

MICHIGAN BASIN

FIGURE VII - 1

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Sources of Wastes

Every day more than 1.6 billion gallons of processing and cooling water flow into the Detroit River -- 1.1 billion gallons from industry and 540 million gallons from Municipal sewage treatment plants. Huge quantities of waste constituents contained in this discharge change the Detroit River from a basically clean body of water at its head to a polluted one in its lower reaches. These waters are polluted bacteriologically, chemically, physically, and biologically, and contain excessive coliform densities as well as excessive quantities of phenols, iron, oil, ammonia, suspended solids, settleable solids, chlorides, nitrogen compounds, and phosphates.

The City of Detroit's main sewage treatment plant, serving more than 90 per cent of the people in the area, contributes 95 per cent of the municipal waste to the Detroit River and is also the major source of suspended solids, phenols, oil, inorganic nitrogen, phosphates, and biochemical oxygen demand in the river. Overflows from combined sewers in Detroit and its suburbs, carrying both stormwater and raw sewage, contribute to the degradation of the river.

In the upper Detroit River, the Great Lakes

Steel Company and the Allied Chemical Corporation are the major sources of industrial wastes. The Ford Motor Company is the principal contributor of inorganic wastes to the Rouge River, and the Scott Paper Company is the principal contributor of organic wastes. Downriver industries contributing significant quantities of wastes are the Great Lakes Steel Corporation, the McLouth Steel Corporation, Pennsalt Chemical Corporation, and Wyandotte Chemical Corporation. On the Raisin River the leading polluters are the two Consolidated Paper Company mills, Monroe Paper Products Company, and the Union Bag-Camp Paper Company.

Other significant sources of pollution in the study area are overflows from combined sewers, municipal and industrial waste spills, and wastes from shorefront homes.

Effects of Wastes on Water Quality and Water Uses

Pollution of the Detroit River causes interference with municipal water supply, recreation, fish and wildlife propagation, and navigation. Two municipal water intakes are endangered by the high bacterial counts of the river. The rising chloride levels indicate potential future problems for industrial water usage. In addition, high concentrations of phenols and ammonia at the Wyandotte water intake have interfered with municipal water treatment by causing taste and odor problems and reducing the effectiveness of chlorination. Excessive quantities of chlorine are needed to reduce bacteria to a safe level.

All forms of water contact sports in the lower Detroit River are hazardous. Declining levels of dissolved oxygen in the lower Detroit River as it enters Lake Erie represent a threat to future water uses. Bottom sludge deposits, oil, and toxic materials threaten fish, migratory birds, and other wildlife. In order to maintain navigation, extensive annual dredging is required at the junction of the Rouge and Detroit Rivers and at the mouths of the Detroit and Raisin Rivers to remove deposits of suspended solids in large part originating in municipal and industrial waste discharges.

The Huron River carries significant quantities of coliform organisms, nitrates, and phosphates. It discharges into a large marsh at Pointe Mouillee with no clear dispersion into Lake Erie. The marsh is subject to backwater from the Detroit River. The backwater and the long retention of pollutants in the marsh tend to mask the effect of the Huron River on Lake Erie.

Stephen Megregian

The lower Raisin River is frequently devoid of dissolved oxygen, resulting in a continuous state of putrefaction during the summer months. All uses of the lower Raisin River except waste disposal and navigation have been eliminated by pollution and deposits of settleable solids. Navigation is also hampered, and extensive annual dredging is required to remove deposited wastes to keep the channels open for routine ship movement. Bacterial counts in the lower River make any recreational use of the water hazardous. The detrimental effect of the Raisin River upon Lake Erie contributes to the enrichment of the waters of the western basin and the high coliform levels at bathing beaches nearby, including Sterling State Park.

The Michigan waters of Lake Erie have two major zones of pollution -- one in the vicinity of the mouth of the Detroit River, and one near the mouth of the Raisin River. Bacteriological densities in the Lake from the mouth of the Detroit River to a point 2 or 3 miles south make the water unfit for recreational use; following heavy rainfall in the Detroit area, this zone is extended southward to Stony Point. Concentration of chlorides, metals toxic to fish life in minute concentrations, and suspended solids in the Lake portend future problems with various water uses.

Pollution stimulated algal growths have forced Monroe to move its water intake point to avoid unpleasant tastes and odors in the water, and algal blooms near the new intake again threaten to degrade Monroe's drinking water. Discharges of nutrients and organic wastes into the Michigan part of Lake Erie have speeded the enrichment of that portion of the Lake.

Water at Sterling State Park is erratically polluted, and this area occasionally has coliform counts exceeding 100,000 organisms per 100 ml. The Raisin River was found to be the chief source of this pollution; when Lake currents are northerly (40 to 45% of the time), polluted Raisin River water is carried directly to the beaches. When currents are southerly, drainage from malfunctioning septic tanks and wastes from Sandy Creek and Stony Creek north of the Park affect the beach water.

Adverse effects of stormwater overflow on water quality were found in the Detroit River and Michigan waters of Lake Erie. During and after heavy rainfalls, sewage plants bypass untreated wastes directly to the rivers, and this can be expected to occur 33 to 45 days a year. The overflows average 8.2 hours and have lasted as long as 5 days. Bacteria in storm overflows often approached the densities found in raw sewage, with counts as high as 100 million per 100 ml. Storm-caused overflows alone are responsible for the discharge of 5 billion gallons of raw sewage to the Detroit River yearly.

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MR. MEGREGIAN: I would like to add one more to the record.

MR. STEIN: All right.

MR. MEGREGIAN: I believe the printed report that you have omitted the discussion of the general recommendations that were contained in that report, which we intended to include in our reading today.

I would like to have that part included.

MR. STEIN: Where is that?

MR. MEGREGIAN: It starts at Page 102.

MR. STEIN: We don't have that. Do you want to add something?

MR. MEGREGIAN: Yes.

MR. STEIN: All right, go ahead if you have something.

MR. POSTON: I think what Mr. Megregian

intends to insert here are the conclusions and the summary of the Detroit conference as agreed upon by the conferees at that conference.

MR. STEIN: Go ahead.

MR. MEGREGIAN: The part that I would add is not included in the report as printed.

MR. STEIN: All right, you read that.

MR. MEGREGIAN: All right.

Recommended Actions

The General Recommendations contained in the "Summary, Conclusions, and Recommendations" volume of the "Report on Pollution of the Detroit River, Michigan Waters of Lake Erie, and their Tributaries," Department of Health, Education, and Welfare, April 1965, were as follows:

It is recommended that:

1. All municipalities provide a minimum of secondary treatment plus adequate disinfection of the effluent.
2. Sewerage systems with collection sewers terminating in adequate treatment facilities be provided in those areas along the Michigan shore of Lake Erie and the Detroit River where sewers do not now

exist and homes discharge either raw wastes or septic tanks effluent to --

MR. STEIN: Mr. Megregian, you are giving the recommendations in the report.

MR. MEGREGIAN: That is correct.

MR. STEIN: Both of the conferees have discussed this here. I think this conference did come up with recommendations and conclusions. Maybe the record should stand on that, rather than doing this on an incerim basis now.

I think we have fairly well disposed of the conclusions in the Detroit aspects of the case. I might mention that Michigan and the Federal Government were unanimous in that case.

We have an active program going on to abate pollution. Mr. Oeming, head of the Michigan program, is at my left. If anyone is interested, we or Mr. Oeming will be happy to make these conclusions available, but I think you are plowing the same ground, Mr. Megregian, if you go over that.

MR. MEGREGIAN: The reason I wanted to include it here was because we were not going to repeat this in the general recommendations for the basin area.

However, it is entirely up to the conferees, as long as we understand that it is a part of the business.

MR. OEMING: Mr. Stein, I would think that we could dispose of this matter adequately if you would include, at the end of this section, the conclusions and recommendations that were reached on June 15 - 18 at the Detroit River-Lake Erie conference.

MR. STEIN: We would be happy to do that.

MR. POSTON: "These are the conclusions and recommendations reached by the conferees."

MR. OEMING: By the conferees, that's right.

MR. POSTON: All right, I would agree to that.

MR. STEIN: All right, sir, go on.

MR. MEGREGIAN: I think Mr. Grover Cook will relieve me now and read the summary and conclusions of this report.

MR. STEIN: Yes. Mr. Cook, before we do that, we have been here a long time and we might take a break.

However, before we take the break, if you live long enough, I guess you see everything. For the first time at one of these conferences, some lady out in Ashtabula, Hazel Hartung, sent us a poem, and I would like to, without objection, include this poem, if I might, in the record.

She says:

I am the Earth.
All mankind suckles at my breast--
As a mother who loves her children
I freely offer all gifts which are best.

All green and growing things . . .
Succulent fruits of my verdant valleys,
Crystal-clear freshets born of mountain snows
-- With no payment of tithes or tallies.

Man is mentor over lesser things
The writhing, pulsing life of oceans,
And warm-blooded beings -- four-footed and furry
Even the molds of his life-saving potions.

All good gifts -- the wind and the rain,
The sun and the snow in their seasons -
Canst tell me why evil for good is returned?
Canst tell me what are Man's reasons?

Now does Man hate his own offspring
That he fouls the Earth for their coming?
My rivers and lakes are full of pollution!
Man sees it not; his fact'ries are humming.

My hillsides are ravaged -- my plains laid waste
Chemicals disturb my balance.
Man's knowledge attacks my placement in orbit
Festoons of refuse form a dirty valance.

Withered, wasted and weary . . .
Racked by unnatural stresses . . .
Futilely working at reclamation
Of field, forest and stream . . . time presses

And I grow old.

Now, if any of you are students of poetry, I ask you to match that half rhyme of "balance" and "valance."

With that we will stand recessed for ten minutes.

(After recess.)

MR. STEIN: May we reconvene?

Mr. Poston?

MR. POSTON: We will proceed with Mr. Cook in the Summary of Conclusions and Recommendations.

CONTINUED STATEMENT OF MR. GROVER COOK, U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MR. COOK: I will now proceed with the Summary of Conclusions and Recommendations.

Conclusions

Lake Erie and its tributaries are polluted. The main body of the Lake has deteriorated in quality at a rate many times greater than its normal aging processes, due to inputs of wastes resulting from the activities of man.

Identified pollutants contributing to damages to water uses in Lake Erie are sewage and industrial wastes, oils, silts, sediment, floating solids and nutrients (phosphates and nitrogen). Enrichment of Lake Erie, caused by man-made contributions of nutrient materials, is proceeding at an alarming rate. Pollution in Lake Erie and its tributaries causes significant damage to recreation, commercial fishing, sport fishing, navigation, water supply, and esthetic values.

Eutrophication or over-fertilization of Lake Erie and the Maumee River is of major concern. Problems are occurring along the lake shoreline and at some water intakes from algal growths stimulated by nutrients. Algal growths can be controlled, and eutrophication of Lake Erie can be retarded and perhaps even reversed by reducing one or more nutrients below the level required for extensive growth.

Soluble phosphate is the one nutrient most amenable to reduction or exclusion from Lake Erie and its tributaries. Present technology is capable of removing a high percentage of soluble phosphates from sewage at a reasonable cost.

More than three-fourths of the soluble phosphates reaching Lake Erie are from municipal waste discharges; this includes some industrial wastes routed through municipal facilities. Proper design and operation of secondary sewage treatment plants will result in significantly greater removal of phosphorus compounds than that produced by primary treatment alone. This will result in substantial reduction of aquatic growths and will be reflected chiefly in a better fishery, a better water supply and better water for recreational uses.

Discharges of municipal and industrial wastes originating in Michigan, Indiana, Ohio, Pennsylvania, and New York are endangering the health or welfare of persons in States other than those in which such discharges originate. This pollution is subject to abatement under the Federal Water Pollution Control Act.

Pollution of the Detroit River and Michigan waters of Lake Erie has been the subject of a previous enforcement conference. Specific recommendations were developed by the Detroit River-Lake Erie Project for all known sources of municipal and industrial wastes in the conference area. At the conference session held June 15 - 18, 1965, the Michigan Water Resources Commission agreed to implement the recommendations of the U. S. Department of Health, Education, and Welfare as contained in the "Report on Pollution of the Detroit River, Michigan Waters of Lake Erie, and their Tributaries."

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The Maumee, Sandusky, Black, Rocky, and Cuyahoga Rivers and their tributaries, all of which are tributary to Lake Erie in Ohio, are grossly polluted. This pollution is caused by refuse, sewage, and sludge resulting in low dissolved oxygen, algal growths, bacterial contamination, and odors associated with polluted waters. This pollution interferes with water uses for municipal and industrial supply, recreation, fishing, and esthetic enjoyment. Specifically, phenols and nitrogenous compounds cause taste and odor problems in municipal water supplies. Other pollutants found in significant areas of these tributary rivers are oil, silt, and sediment.

Lake Erie and its tributary streams in the Pennsylvania basin are polluted by discharges of municipal and industrial wastes, combined sewer overflows, accidental spills from vessels and industries and wastes from Lake vessels, and land drainage. This pollution has caused taste and odor problems in domestic water supplies, bacterial contamination of bathing beaches, fish kills and algal growths. In addition, wastes which cause the receiving waters to foam, turn blackish-brown, and have a foul odor have interfered with recreation and esthetic enjoyment.

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Lake Erie and its tributary streams in the western New York basin and the Erie-Niagara basin in New York are polluted by municipal and industrial wastes. Discharges of these wastes cause interferences with municipal and industrial supplies, recreation, fish and aquatic life. In addition, these wastes cause discoloration of the receiving waters, foul odors and algal growths.

General Recommendations

Lake Erie is more than a valuable water resource; it is a priceless natural heritage. The present generation has an obligation to use it wisely and to preserve it for posterity. Each city and town, each industrial firm - each and every citizen of the basin - must bear a share of that responsibility.

Recommendations for abating water pollution interfering with water uses in Lake Erie and its tributaries will be made in two groups: general recommendations, covering the broad objectives of pollution abatement in the conference area, followed by specific recommendations in Parts 2 and 3 of this report, for the solution of particular problems. The specific recommendations are offered in addition to, and not in place of, the general recommendations.

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The recommendations which limit the effluent concentration of a particular waste constituent are made with the purpose of reduction of waste loadings from a facility. If changes in concentration are brought about by increased dilution, combination of outfalls, or other methods without reducing waste loading, a corresponding decrease in recommended waste concentrations will be required.

Municipal Wastes

It is recommended that:

1. Municipal wastes be given secondary biological treatment; such treatment to produce an effluent not exceeding the following concentrations:

    a. Suspended solids - 35 mg/1
    b. Settleable solids - 5 mg/1
    c. Ammonia - 2 mg/1
    d. Phenol - 20 micrograms per liter
    e. Oil - 15 mg/1
    f. 5-day BOD - 20 mg/1

2. Secondary treatment plants be so designed and operated as to maximize the removal of phosphates.

3. Disinfection of municipal waste effluents be practiced in a manner that will maintain coliform

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concentrations not to exceed 5,000 organisms per 100 ml, and not to exceed 1,000 organisms per 100 ml where the receiving waters in proximity to the discharge point are used for recreational purposes involving bodily contact.

4. All new sewerage facilities be designed to prevent the necessity of bypassing untreated wastes.

5. Combined storm and sanitary sewers be prohibited in all newly-developed urban areas, and eliminated in existing areas wherever opportunity is afforded by redevelopment. Existing combined sewer systems be continuously patrolled and flow-regulating structures adjusted to convey the maximum practicable amount of combined flows to and through treatment plants.

6. A program be developed to prevent accidental spills of waste materials to Lake Erie and its tributaries. In-plant surveys with the purpose of preventing accidents are recommended.

7. Unusual increases in waste output and accidental spills to be reported immediately to the appropriate State agency.

8. Disposal of garbage, trash, and other deleterious refuse in Lake Erie or its tributaries be prohibited and existing dumps along river banks and shores of the Lake are to be removed.

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Industrial Wastes

It is recommended that:

1. Industrial plants improve practices for the segregation and treatment of waste to effect the maximum reductions of the following:

   a. Acids and alkalies

   b. Oil and tarry substances

   c. Phenolic compounds and organic chemicals that contribute to taste and odor problems

   d. Ammonia and other nitrogenous compounds

   e. Phosphorus compounds

   f. Suspended material

   g. Toxic and highly-colored wastes

   h. Oxygen-demanding substances

   i. Excessive heat

   j. Foam-producing discharges

   k. Other wastes which detract from recreational uses, esthetic enjoyment, or other beneficial uses of the waters

2. The Michigan Water Resources Commission, the Indiana Stream Pollution Control Board, the Ohio Water

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Pollution Control Board, the Pennsylvania Sanitary Water Board, and the New York State Department of Health are to undertake action to insure that industrial plants discharging wastes into waters of Lake Erie and its tributaries within their respective jurisdictions institute programs of sampling their effluents to provide necessary information about waste outputs. Such sampling shall be conducted at such locations and with such frequency as to yield statistically reliable values of all waste outputs and to show their variations. Analyses to be so reported are to include: pH, oil, tarry residues, phenolics, ammonia, total nitrogen, cyanide, toxic materials, total biochemical oxygen demand, and all other wastes listed in recommendation #1, under Industrial Wastes.

Waste results to be reported in terms of both concentrations and load rates. Such information will be maintained in open files by the State agencies for all those having a legitimate interest in the information.

Surveillance

The Department of Health, Education, and Welfare will establish water pollution surveillance stations at appropriate locations on Lake Erie and its tributaries. The Department will welcome the participation and assistance of the appropriate State agencies.

The effectiveness of improvement measures, especially steps for phosphate removal, should be observed over the coming years, and additional measures instituted as a need is indicated.

Mr. Megregian will give you the specific recommendations.

MR. STEIN: Will you refer to the page so that they can follow you as you go through? You are in Volume 2, aren't you?

MR. MEGREGIAN: We are in Volume 2, that is correct. We pulled these out. I don't have the page numbers.

MR. STEIN: That is all right then. Go right ahead.

CONTINUED STATEMENT OF MR. STEPHEN MEGREGIAN, U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MR. MEGREGIAN: Recommended Actions for the

Maumee River Basin.

The recommendations for pollution abatement set forth in Chapter I, Part 1 should be adopted where applicable in the Maumee River Basin. In addition, it is recommended that the following specific actions be taken:

1. The City of Defiance improve its collection system and treatment facilities, and resolve with Johns Manville Company the problem of excessive phenol discharges.
2. The following industrial plants take the necessary action to provide waste treatment facilities to reduce their waste loadings to the receiving stream:

Interlake Iron Company	Solids reduction
Johns Manville Company Waterville	Solids and BOD reduction
Defiance	Phenol reduction
Buckeye Sugars, Inc.	Evaluate completed improvements
National Refinery	Oil removal

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Standard Oil Company

Refinery	Phenol reduction
Petrochemical	Evaluate completed improvements
Chemical Company	Nitrogen removal

3. Intensified effort in control of soil erosion and land use practices, to reduce the inputs to receiving waters of silt and nutrients.
4. The Department of Health, Education, and Welfare, in cooperation with other Federal agencies and the States involved, investigate means of providing streamflow regulation to maintain desirable water quality after all practicable measures have been taken to eliminate or control waste discharges at their sources.
5. The unknown source of waste on the St. Marys River be located and brought under control.

Recommended Actions for the Western Ohio Basin

The recommendations for pollution abatement set forth in Chapter I, Part I, should be adopted where applicable in the Western Ohio Basin. In addition, it is recommended that the following industrial plants take the necessary actions listed:

Industry	Necessary Action
General Motors Corporation Ternstedt Division	Cyanide and metal reduction
Swift and Company	Oil removal
General Electric Company	Treatment of sewage
Bechtel-McLaughlin	Chromium reduction
The Baltimore and Ohio Railroad Company	Oil removal

Recommended Actions for the Rocky River Basin

The general recommendations for pollution abatement set forth in Chapter I, Part I, should be adopted where applicable in the Rocky River Basin. In addition, it is recommended that the following specific actions be taken:

1. A master sewerage plan be prepared for the Cleveland metropolitan area, including Cleveland, its suburbs, and rapidly developing urban lands - and an appropriate regional organization be given

authority and responsibility for its implementation.

Recommended Actions for the Cuyahoga River Basin

The recommendations for pollution abatement set forth in Chapter I, Part 1, should be adopted where applicable in the Cuyahoga River Basin. In addition, it is recommended that the following specific actions be taken:

1. The following industrial plants take the necessary actions listed:

Industry	Necessary Action
Republic Steel	Removal of spent pickling solutions; Increased oil and solids removal
Standard Oil Corp.	Oil removal
U. S. Steel Corp.	Removal of spent pickling solutions; Increased solids removal
E. I. DuPont	Metals reduction
Jones and Laughlin Steel Company	Removal of spent pickling solutions
Harshaw Chemical Company	Metals reduction

Industry	Necessary Action
Cuyahoga Meat Company	Reduction of solids and BOD
Masters Anodizers and Platers, Inc.	Metal reduction
Sonoco Products Company	Reduction of solids and BOD
Thompson Ramo Woolridge	Metals reduction

2. A master sewerage plan be prepared for the Cleveland metropolitan area, including Cleveland, its suburbs, and rapidly developing urban lands -- and an appropriate regional organization be given authority and responsibility for its implementation.

3. Similar action to No. 2 be taken in the Akron metropolitan area.

Recommended Actions for the Eastern Ohio Basin

The recommendations for pollution abatement set forth in Chapter I, Part I are to be adopted where applicable in the Eastern Ohio Basin. In addition, it is recommended that the following specific actions be taken:

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1. The following industrial plants take the necessary actions listed:

Industry	Necessary Action
Olin Mathieson	pH Control and Solids Reduction
Cabot Titania Corp.	Solids Reduction
Detrex Chemical Industry	Reduction of Iron and Chlorinated Hydrocarbon
Reactive Metals	Solids Reduction and pH Control
Diamond Alkali Co.	Solids Reduction
General Tire & Rubber Co.	Solids Reduction
Industrial Rayon Co.	Metals Reduction
Cleveland Electric Illuminating Co. (Eastlake)	Solids Reduction

2. Master sewerage plans be prepared to guide development in areas where urbanization is taking place.

This is the end of the recommendations through Part 2.

MR. STEIN: Thank you.

We will open this now for questioning, although I think right at this point maybe we can save some time. I would like to clarify one point on jurisdiction here.

I don't think that it is within the jurisdiction of the conferees under the Federal law to make any recommendations on regional organization. While we appreciate the recommendations, I think that is beyond the scope of our authority. We certainly will give consideration to all the others.

So, if we have any questions, we can go ahead with them.

Mr. Oeming, do you have any?

MR. OEMING: Yes, Mr. Stein.

Mr. Stein and fellow conferees:

I have a number of questions, and perhaps some of them will refer to the testimony or the statement made by Mr. Cook and some by Mr. Megregian. I don't know how you wish to handle these.

MR. STEIN: Why don't you ask the question, and the one who wants to answer it will answer it, unless you direct the question to a specific one.

These men may have other specific experts from the organization with them. I see a sprinkling of them in the audience.

On any of these questions, if you feel that you want to call on these people, call them up so that you can get a precise answer.

MR. OEMING: On Page 9 there is a statement that the annual evaporation from the Lake surface averages 33.5 inches.

Was this determined by the Public Health Service in this two year study?

MR. COOK: I don't think it was, Mr. Oeming. I think this probably was information from the Weather Bureau.

MR. OEMING: Now, on the whole matter of lake currents, both surface and circulation of currents, is this information that was determined during the past two years from your Lake stations, or is this from some other source?

MR. COOK: Most of it is from work of the last two years, some from Lake stations, some from dye studies, some from Drogue, and other studies. Some of the information was substantiated by previous studies.

MR. OEMING: I see. On Page 14 there is a table in the report that lists municipal water supplies on Lake Erie, and Michigan is listed as having two. I wonder if you would tell us what those two are.

MR. COOK: Well, Monroe must be one of them.

MR. MEGREGIAN: I believe the second one was listed as the Enrico Fermi Treatment Plant, and I understand that after it was listed, it should not have been since it is not a municipal supply.

MR. OEMING: It does not furnish water for municipal uses. That is the understanding that this table is intended to convey, and it is not accurate.

On Page 16 there is a figure given for the decline of the fishing in Lake Erie, and the most recent figure that is given in the report is 7,400 pounds for blue pike in 1960.

Do you have any more up to date information than that, say as of 1964? 1964 would be adequate.

MR. COOK: I couldn't answer that, Mr. Oeming. Possibly there were no more blue pike.

(Laughter.)

MR. OEMING: Well, possibly there might be more too, mightn't there?

MR. COOK: That is possible. I think this was a statement from a summary report dated 1960.

MR. OEMING: But you haven't anything for 1964?

MR. COOK: I am sure we have information in the files on it, yes.

MR. OEMING: I have to go back to this

question that I directed to Dr. Tarzwell this morning.

I wonder if you can tell me this: On Page 17, where you are talking about phosphorus being a constituent in domestic sewage and certain industrial wastes, and that it must be controlled, what are we talking about? Are you referring to soluble phosphorus, total phosphorus, or phosphorus as what?

MR. COOK: We are talking about total phosphorus, PO_4. That is PO_4. Did I say "soluble phosphate"? That is what I meant, total soluble phosphate, PO_4.

MR. OEMING: That is what you mean throughout your report when you are talking about phosphorus?

MR. COOK: That is right.

MR. OEMING: Then this .03 means total soluble phosphorus as PO_4?

MR. COOK: Total soluble phosphate as PO_4.

MR. OEMING: Phosphate as PO_4.

On Page 20, has the DO depletion been found in the western basin during this two year study?

MR. COOK: Yes, sir.

MR. OEMING: On how many occasions, sir?

MR. COOK: On one occasion.

MR. OEMING: One occasion?

MR. COOK: Yes.

MR. OEMING: At the bottom of Page 20, I wonder if you would expand a little bit on the basis for the statement that the DO deficit is caused largely by lake enrichment?

What portion is traceable to other sources than sewage and domestic wastes? And is the DO depletion entirely accounted for by the amount of soluble phosphorus introduced by waste sources?

MR. COOK: Well, I will take the first part of that question first.

No, it isn't all, of course, caused by the introduction of domestic wastes or industrial wastes. The indirect effect of organic enrichment by agricultural runoff is also a part of this.

It is a very difficult thing to measure, and we haven't measured it, frankly.

MR. OEMING: You haven't measured the others?

MR. COOK: The effect from agricultural runoff, but we know it is substantial. We mention in the report that better soil practices, agricultural practices, have to be put into effect in the Maumee Basin, for instance, in order to help control this.

Now, the second part of your question was what?

MR. OEMING: I asked you what portion was traceable to the wastes, and then I asked you, is depletion of DO entirely accounted for by the amount of soluble phosphorus introduced by waste sources.

MR. COOK: No, I don't think it is. A large amount of it is, of course. The other part is the amount of percentage of materials that are introduced into the Lake at various waste sources.

MR. OEMING: On the next page, there is a statement that oxygen deficits occur only in those lakes where large amounts of oxygen consuming materials or nutrients have been introduced. Is this true in every case?

MR. COOK: That is true.

MR. OEMING: Irrespective of whether the natural bottom is mud or peat, or it doesn't matter what material?

MR. COOK: If the bottom is mud or peat, it is that way because of the introduction of nutrients and organic materials from natural sources or man-made.

MR. OEMING: In other words, all lake originally had nice clean bottoms, and the runoff --

MR. COOK: We weren't here when they were originated, but most of them were -- glacial lakes, yes.

MR. OEMING: The western basin does not become stratified, you indicate, except during 6 to 7 day periods of calm, and the central and eastern basins do become stratified.

I wonder if you would reconcile these two statements with the fact that nutrients are present in the eastern and central basins.

Do you follow my question?

MR. COOK: Not exactly, no.

MR. OEMING: Well, there are nutrients present in the eastern and central basins, aren't there?

MR. COOK: Yes.

MR. OEMING: DO depletion occurs steadily in the central basin and eastern basin; is that true?

MR. COOK: Correct.

MR. OEMING: But DO depletion was only found in one particular instance in the western basin.

MR. COOK: That is right, following the long period of calm.

MR. OEMING: Now, the nutrients are present in both cases, are they not?

MR. COOK: That is correct.

MR. OEMING: How do you explain the lack of dissolved oxygen depletion to the same extent in the western basin as you have in the eastern basin?

MR. COOK: Because it doesn't become stratified in the western basin except under an unusual situation. The oxygen demand by the bottom muds is not exerted to the same extent. That is, there is complete mixing throughout most of the year in the western basin.

MR. OEMING: You charge it all to mixing then?

MR. COOK: Not all to mixing, but partially to mixing.

MR. OEMING: I see, but don't you say later that the overall easterly movement carries some of the materials to the quieter waters of the central basin, where it settles to the bottom?

MR. COOK: Yes. In the western part of the central basin, the water is quieter, it is deeper, and therefore there is not the top to bottom mixing that there is in the western basin.

MR. OEMING: I see. On Page 25, you have a table that says "Industrial Waste Sources - State Classification." The third column is headed "Unknown," with numbers for each State underneath it.

Would you explain what you mean by "unknown" there? Does that mean that they don't know about it, or that it has not been evaluated?

MR. MEGREGIAN: May I answer that?

This listing was brought together to indicate that out of a total industrial waste, of known industrial waste sources as represented opposite each State, that a certain portion of these were known to be inadequate, and the other number, the unknown, means we do not know whether these are adequate or inadequate.

MR. OEMING: At the bottom of the page, the following statement is made:

"Data have not been made available for the computation of meaningful waste loads from industries."

Do you mean this to apply to the Detroit River report of the Public Health Service, in which you had complete information on all of the industrial waste sources? Is that meaningful or not?

MR. MEGREGIAN: Not at all, Mr. Oeming. This applies only to the Lake Erie Basin.

MR. OEMING: This doesn't say that it applies only to Lake Erie, does it?

MR. MEGREGIAN: I'm afraid it doesn't.

MR. OEMING: All right.

Now, on Page 26, I wonder if you would clarify the two statements in the second and third paragraphs with respect to suspended solids.

I have in mind particularly the first sentence in the second paragraph, which states: "These substances that have damaging effects on the water use of the total waters of the Lake are suspended solids," and then other things.

Then, in the next paragraph, it states: "Damage to Lake Erie resulting from suspended matter" -- and then drop down to the end of the sentence -- "having largely local effects."

My question here is: Would you reconcile these two statements? One says that the total waters of the Lake are affected, and then in the next paragraph it says it has only largely local effects.

MR. COOK: I think both statements are correct, to a degree.

Under the inputs up above in the introductory paragraph, where it states there that suspended solids indicate lake-wide problems or effects, that was stated because we know that suspended solids, depending on their nature, how heavy they are or how light they are, can sometimes be carried a long ways by mass transportation of water.

However, I think you will agree that the greater effect is the localized effect of solids that settle near the waste loadings.

MR. OEMING: You are giving more emphasis then to the local effect rather than the effect on the total body of the Lake; is that right?

MR. COOK: Yes, sir.

MR. OEMING: All right.

Further down on that page, you state: "Control must be instituted through improvements in land use practices on the watershed."

I don't find any specific recommendations here. Do you have any for the guidance of this board?

MR. COOK: I wish we could. I wish we could. I think all of us who have worked in water pollution for some time know that this is a problem.

I think something needs to be done. I am not sure what it would be. Perhaps the conferees will think of something.

We have not made any recommendations, no, sir.

MR. OEMING: On Page 27, you indicate the concentration of chloride being of the magnitude of 7 mg/l in the headwaters of the Detroit River and 23 mg/l at Buffalo, a threefold increase.

I wonder if you could tell me what you feel is the significance to water uses of this increase?

MR. COOK: I think we all agree there is no damage to any water use from this kind of increase, and I think we made it fairly clear that the only reason we presented this information was because it does indicate a rather dramatic increase of one constituent over a relatively short period of time.

MR. OEMING: But it is doing no damage?

MR. COOK: Doing no damage.

MR. OEMING: To the fish or bottom animals?

MR. COOK: To my knowledge, it is not damaging to the fish.

MR. OEMING: When you computed the increase in chloride because of the use of salt on the streets, as to this 800,000 tons a year, first of all, is this from the total basin, did you determine?

MR. MEGREGIAN: This is from the data that was supplied to us by various --

MR. STEIN: Would you speak into the microphone, please?

MR. MEGREGIAN: This is from the results of data that were supplied to us from the salt companies themselves, that were producing and delivering salt to the Lake Erie Basin.

This does not include Detroit, I don't believe.

MR. OEMING: I don't think it does either.

You have computed now an increase in the chloride level of the Lake water. Is this weighted to the period in which these chlorides would reach the Lake water -- that is, during the runoff period?

MR. MEGREGIAN: This is an annual average for the whole Lake.

MR. OEMING: I see.

MR. MEGREGIAN: It does not include any concentration changes, or for seasonal purposes, no.

MR. OEMING: It would be higher, wouldn't it, because these salts reach the Lake during two months of the year probably?

MR. MEGREGIAN: That is correct.

MR. OEMING: Two or three?

MR. MEGREGIAN: That is correct.

MR. OEMING: Now, with respect to the dissolved solids, here you evaluated the increase from 110 to 115 mg/l at present, and the increase in Lake Erie at Buffalo in the same period from 115 to 192.

Would you tell me what significance there is in this to water uses?

MR. MEGREGIAN: I would respond the same way as Mr. Cook did with respect to chlorides, merely to indicate that there is a greater use of these waters which receive these inorganic salts as discharges, and therefore, while there is no specific problem today, this is a forewarning that there might be problems in the very near future.

MR. OEMING: With regard to the next paragraph, Nitrogen Compounds, would you discuss a little more here what happens in phosphorus removal? If nitrogen continues to support algae, how much is accomplished with phosphorus removal in terms of arresting growth?

As I understand your statement, nitrogen is a factor in this fertilization of the Lake. This is something that can't be controlled.

Now, if it is a factor, it is going to remain after the phosphorus would be taken out, isn't it? How much good then would we do?

This is my question.

MR. COOK: Well, the nitrogen is in good supply throughout the world and every place in nature, including the atmosphere.

Any attempt to reduce the nitrogen to effect a reduction in algal growth would be like punching feathers.

Incidentally, nitrogen is not the only other growth factor. There are a good many other elements that we have to have in measurable amounts in order to grow algae -- some in trace amounts. Nitrogen is probably the one that is in greatest supply. It will be there no matter what we try to do.

Secondary treatment will substantially remove some of the nitrogen, but if the other growth factors are present for algae growth, nitrogen is not much of a problem. Somehow or other, nature will find a way to supply nitrogen to the algae.

MR. OEMING: On Page 28, toward the end of the second paragraph, you state that in 1964, or, rather, the third paragraph -- meaning phosphates, I guess -- "It produced an oxygen deficit estimated at 270,000,000 pounds."

Am I correct that you have attributed the deficit in oxygen now to the phosphate which you know is going into the Lake? You have been able to put a finger on it?

MR. MEGREGIAN: This computation developed from the observations that the 2600 square miles of the

Lake exhibited an oxygen deficiency at a level of zero to 2 mg/l.

In calculating what kind of an oxygen consuming substance could produce such a deficit, we had to arrive at the conclusion that this is nature-produced, resulting from nutrients, since there are no other man-made sources of any kind that could produce such a deficit in such a short time.

MR. OEMING: Well, I guess we have to explore this a little bit more.

Are you saying that the total deficit then is solely attributed to phosphates?

MR. MEGREGIAN: The phosphates are the stimulating forces that produce the organic material or the productivity, if you will, that later decays and produces this oxygen deficit.

MR. COOK: I think we should include also that some of these oxygen consuming materials are those organic sediments that have unsettleable material for a while that have come in through waste sources.

The phosphates indirectly do develop oxygen consuming materials, but others from waste sources, rivers and direct discharges, certainly are a factor to it.

MR. OEMING: Well, did you find very much unsettleable organic material as such -- not as phosphates, but unsettled organic material in the Lake proper?

MR. MEGREGIAN: No.

MR. OEMING: Let's take, for example, the line across the Erie Island.

MR. MEGREGIAN: Yes.

MR. OEMING: Did you find very much across that section of unsettled oxygen demanding material that would extract oxygen from this portion of the Lake?

MR. MEGREGIAN: Not in any single sampling run.

MR. OEMING: In any run, let's say, or a combination of them.

MR. MEGREGIAN: No, we did not, not as measured by the BOD tests.

MR. OEMING: All right. The total of all oxygen consuming wastes from man-made sources then is only a small portion of the demand?

MR. MEGREGIAN: That is right.

MR. OEMING: That is, this is a negligible portion, despite the fact that there might be primary or secondary, or no treatment at all?

MR. MEGREGIAN: This is the thing that we arrived at.

MR. OEMING: I see.

MR. MEGREGIAN: I believe our report indicates that there is, in the total, something like 3 to 4 million population equivalents discharging into the basin daily.

On the matter of pounds of BOD, dividing this number by 6, we arrive at a biochemical oxygen demand, a five-day demand, on the nature of perhaps a million pounds per day.

This deficit certainly that was actually developed here is much greater than the total daily input of biochemical oxygen demand from any or all sources.

MR. OEMING: Now, at the top of the page, Mr. Megregian, the next page, you point out that at least 40 per cent of present PO_4 input -- is that what you measured? You are talking now about what comes from sources such as sewerage and wastes? You don't include the total input to the Lake?

MR. MEGREGIAN: We include only those sources that we feel could be controllable. In other words, we included sources that were man-made or approachable by man in the controls.

MR. OEMING: Would you have any idea what fraction we would be dealing with if we would be talking about the total input of the Lake? Do you have any notion about this?

It would be something less than 40 per cent, wouldn't it?

MR. MEGREGIAN: I am not sure about that.

We included in our totals -- in the 175,000 pounds per day totals in our Table 8, I believe -- all of the inputs from man-made sources that were discharging directly to the Lake, and also the measured inputs from our sampling program that were discharged by the tributaries, so in effect we think we have got a good deal of the soluble phosphate input to the Lake.

I am not sure whether we have 75 per cent or 90 per cent or 95 per cent, but we think we have got a good portion of it.

MR. OEMING: In that connection, one of the reasons I raised that question is because when you got into Part 2, I didn't see the input from the Maumee River as such. I saw the input to the river, but I did not see the input to the Lake from the river.

MR. MEGREGIAN: Well, that was summarized in Part 1.

MR. OEMING: It was?

MR. MEGREGIAN: Yes, sir.

MR. OEMING: Mr. Cook indicated that you had only measured a portion, and you didn't know what fraction you were measuring here when you were talking about sewerage and wastes -- that you had no way of evaluating the land runoff sources and these other things.

MR. MEGREGIAN: His answer is correct in terms of the discharges of the Maumee River.

We have here in Table 8, on Page 50, soluble phosphates to Lake Erie, and we list Maumee River as 11,000 pounds per day.

This is a measurement that we made above the Lake affected portion of the Maumee River, which indicated to us this is what is coming into the Lake from above, regardless of the source, whether it is municipal or land runoff or industrial. This was what was being carried by that river into the Lake.

Then we have added to it these other inputs as we have measured them and determined them. For instance, the City of Toledo is included here separately.

MR. OEMING: In the last paragraph you state: "After these treatment practices are in operation it can be reasonably expected that significant improvement in the water quality in Lake Erie will be observable within a few years."

I wonder if you could enlarge upon that and educate me a little more. In what terms would there be significant improvement, related to DO, nuisance blooms, water quality, taste, odor, recreation, fish, or whatever you like?

MR. COOK: First of all, Mr. Oeming, I would like to go back to some of the words that Dr. Tarzwell used earlier today, when he said that we were at the threshold, and that if improvement or retardation of this situation weren't implemented very shortly, we could have a much more serious situation.

Now, if you stop to think that under favorable conditions, one pound of soluble phosphate can grow a million pounds of algae, it stands that removing one pound of phosphate or by preventing it getting into the Lake would have a very fine effect, and if you multiply this by several thousand, you really come up with something.

In other words, it is the introduction of these materials over a long period of time that has created the problems we have had. If we now start going the other way, by reducing these inputs there is every reason in the world to expect we will have improvement almost immediately -- I would say within one decade after the implementation of the programs we are presenting is carried out.

MR. OEMING: Well, you have given me a very nice figure here. I wish it had been in the report before. I wouldn't ask all these questions.

One pound of phosphate will remove how many pounds of algae?

MR. COOK: No. Remember I said under favorable conditions.

MR. OEMING: Well, I am assuming these are favorable.

MR. COOK: It is conceivable that the removal of one pound of soluble phosphate could remove or could prevent the growth of one million pounds of algae.

MR. OEMING: In other words, if we follow this table on Page 28 and remove all of this phosphate, 72,000 pounds, we could multiply that by a million and take that much algae out of the Lake?

MR. COOK: I would hope we could do that.

MR. OEMING: How much of the oxygen deficit of 270,000,000 pounds would be reduced by this? You have given me a nice figure on this algae. Now let's get to the oxygen. I am concerned about this big hole out here without any oxygen in it.

MR. COOK: Well, it has been there for some time, and it is apparently getting worse. If we can just hold it and keep it from getting any worse right now, if we can prevent that area from becoming anerobic and then prevent the recirculation of more phosphorus from the bottom of the Lake, this is the thing we are aiming at right now.

This is the immediate concern, to prevent the Lake from getting any worse. From there on, we can move ahead perhaps.

MR. OEMING: Well, you don't have any nice rule of thumb like you gave me on algae, where so many pounds of oxygen will be restored by every pound of phosphorus you take out?

MR. COOK: That is something for a mathematician or a biologist. I'm sorry.

MR. STEIN: This is an engineering question you are asking. Do we have an engineer who wants to try that?

(No response.)

MR. STEIN: No? All right.

MR. OEMING: When you were talking about the phosphorus load on the Lake, you said a phosphorus load from the tributaries themselves as differentiated from the loadings into the tributaries.

MR. MEGREGIAN: Yes.

MR. OEMING: Do you have that for the Cuyahoga River as a whole to the Lake now? I haven't been able to find it. I only found the contributions to the Cuyahoga, but not to the Lake.

MR. MEGREGIAN: Let me bring you back to the table again.

MR. STEIN: What page is that, Mr. Megregian?

MR. MEGREGIAN: On Page 50. I believe we have the Cuyahoga River there as contributing 3,500 pounds to the Lake.

MR. OEMING: I see. Mr. Megregian, I missed that. I'm sorry.

In two places, in both reports, and I am referring now to the Detroit River conference, the statement is made that at the conference session held June 15 to June 18, the Michigan Water Resources Commission agreed to implement the recommendations of the U. S. Department of Health, Education, and Welfare as contained in the Report on Pollution of the Detroit River, Michigan waters of Lake Erie, and their Tributaries, April 1965.

I would refer you to the conclusions and recommendations which have been attached now, Mr. Megregian, to Part 2, and ask you if you find in there that particular statement?

MR. MEGREGIAN: No, this is not included in our text.

MR. OEMING: I am not asking if it is included in the text. I am just asking you if you find the statement in Part 2 of the report is confirmed by the conclusions and recommendations reached by the conferees at the Detroit conference?

MR. COOK: The answer is no, Mr. Oeming.

MR. OEMING: The answer is no. Which do you think controls?

MR. COOK: I think that is with the conferees --

MR. OEMING: Somebody wrote this report, and I just want to know which we are to rely upon here, whether we rely upon the conclusions of the conferees, or rely upon this report?

MR. COOK: If you want my opinion --

MR. STEIN: Wait a minute. Mr. Poston and

I were sitting here all afternoon waiting to see how long it would take you to pick that out.

Obviously, the conclusions of the Detroit conferees will govern.

MR. OEMING: All right. Now I would like to go to the Conclusions and Recommendations. Perhaps some of these questions have been answered, and perhaps not.

On Page 1, it states: "The main body of the Lake has deteriorated in quality at a rate many times greater than its normal aging processes," and so forth.

With respect to what constituents has it deteriorated in quality? I am talking about the main body of the Lake.

MR. COOK: Well, I think we have made it clear in the report, Mr. Oeming, that the reflection of this is in the algae primarily, not only the suspended algae that causes the water to become murky and green and causes dissolved oxygen deficit, but also the filamentous forms that wash up on the beach and foul fishermen's nets, and this sort of thing.

This essentially is what we are talking about here.

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MR. OEMING: Not bacterial contamination or toxic conditions?

MR. COOK: The overall condition is principally one of over-fertilization.

MR. OEMING: I see. We have been over this question about the level required for extensive growth, and I guess there isn't any use pursuing that question further.

MR. COOK: I think you are right.

(Laughter.)

MR. OEMING: You opened a question here in my mind, in the fourth paragraph, about the technology for reducing these phosphates, and you state: "Present technology is capable of removing a high percentage of soluble phosphates from sewage at a reasonable cost."

My question here is directed at what you mean by "a reasonable cost"?

MR. MEGREGIAN: I think I had a statement prepared in anticipation of this kind of question.

MR. OEMING: I'm glad I didn't disappoint him.

(Laughter.)

MR. MEGREGIAN: Presently operating secondary treatment plants have reported in recent literature phosphate removals anywhere from 10 to 74 per cent.

Just as a background, the Metropolitan Sanitary District of Greater Chicago has reported as much as 74 per cent on one of its treatment plants, and 50 per cent on another, and about 25 per cent on a third.

A recent article in the Water Pollution Control Journal by Levin has indicated that increased removals by secondary treatment plants can be affected by several things, such as a higher aeration rate in the aeration tank, higher proportions of returned sludge, and --

MR. OEMING: Mr. Megregian, I don't want you to go into this. My question is directed to cost.

MR. MEGREGIAN: Cost? We have not, of course, specifically determined cost.

MR. STEIN: I think we may get an answer to this.

Is Mr. Coulter here? I think we might get you an answer. Mr. Coulter, will you come up?

You know, you ask these engineering questions, so we might get an engineer up here.

I don't remember the cost figure, but I think they did some work at the nuclear installation at Hanford. We really had a problem with phosphorus, because the phosphorus was radioactive and we really had to get it out.

They developed a flocculation technique out there using alum, I believe, and came up with some costs per million gallons, which, I understand, were relatively reasonable.

Do you recall that, Jim?

MR. COULTER: My name is James B. Coulter. I am Chief of the Water Projects Section in Washington, D. C., Department of Health, Education, and Welfare.

Mr. Oeming, I believe the question was what are the costs for the removal of phosphates?

MR. OEMING: My question went to the question of reasonable cost, and I wondered what you considered as reasonable cost.

MR. COULTER: I can give you some limits on it. The Advanced Wastes Research Project has been working on phosphate removal, assembling costs, computing the unit processes that would go in to substantially complete phosphate removal.

As an outer limit, we think the cost would be between five and eight cents per thousand gallons for complete removal, utilizing coagulation and sedimentation processes.

I believe that the recommendations here have to do with secondary treatment. If a secondary treatment process or a secondary treatment plant were in place, and if it had incineration or other means of disposing of the sludge, the cost of phosphate removal would be perhaps no greater than the maintenance and operating cost of the plant if you ran at the maximum BOD removal.

I would simply be an adjustment in the plant operation.

MR. OEMING: Well, Mr. Coulter, this coagulation and sedimentation would remove phosphate at a cost of about five cents a thousand gallons?

Now, this is primary treatment, supplemented by coagulation and sedimentation?

MR. COULTER: No. That is secondary treatment followed by coagulation, sedimentation, and filtration.

MR. OEMING: So that if you added it to a presently existing plant, you would add about five cents a thousand gallons?

MR. COULTER: If you wanted to go to complete phosphate removal, as they are doing, for instance, in the Tahoe installation in California.

MR. OEMING: That answers the question.

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MR. STEIN: Thank you, Mr. Coulter. Remain available, please.

MR. OEMING: I guess Mr. Cook might answer this, and perhaps you have answered it in another way.

When you say that discharges are endangering the health and welfare of persons in states other than those in which such discharges originate, is this demonstrated primarily in the body of the Lake now by the enrichment of the Lake, the nutrient problem?

MR. COOK: Yes, sir.

MR. OEMING: You said there was no bacterial contamination.

MR. COOK: That is right.

MR. OEMING: On the question of land drainage, I have asked you if that can be corrected, and you have answered that you don't know how, haven't you, or you have no proposals at this time for us to adopt here as conferees?

MR. COOK: No, sir.

MR. OEMING: At the bottom of Page 2, the recommendations which limit the effluent concentration of a particular waste constituent are made, with the purpose of reduction of waste loadings from a facility.

Shouldn't the purpose be to abate pollution?

MR. COOK: That is correct. This is inserted here, because it would be conceivable that particularly an industrial organization could reduce their concentration by merely diluting it with more lake water.

For example, yesterday, when we were taking our trip up the Cuyahoga River, we saw two large twin outfalls that were side by side, and separated only by a concrete wall. One of these contained a very strong waste, and the other only cooling water.

It would be a simple matter to go up the sewer a little ways and break a hole and dilute it.

This we don't want to have.

MR. OEMING: With reference now to your specific recommendations on municipal wastes, in view of the importance we have attached so far in this conference to phosphates, could you tell me why hasn't a figure been given for phosphates as a goal, a concentration goal, in your recommendations?

MR. COOK: We recognize that treatment plants have individual designs, and we are reasonable people.

I think that the best we can do is ask for maximum phosphate removal under the best operating practices.

MR. OEMING: Well, I would like to know what you think is maximum for phosphate removal?

MR. COOK: We have said in the report as much as 65 per cent should be removed, with a plant that was well designed and well operated.

We recognize some plants are not that well designed, and less removal might be effected even at maximum secondary treatment.

That is the best we can do, I'm afraid.

MR. OEMING: All right.

MR. STEIN: Let me see if I understand it.

I wish Mr. Coulter wouldn't disappear so rapidly. Maybe he can hear this.

As I understand the situation here, there is a tremendous variance in the phosphate removal in secondary treatment ranging between, you said, about 25 and 75 per cent.

The notion that these people have, I think, is to maximize the operations of every secondary treatment plant, to remove the maximum amount of phosphates in this area.

It is recognized that not all plants will be able to get up to 75 per cent removal because of the basic design of the plant, but we will try to get as much phosphates out as we can. The notion is to try to go ahead and do that and see how much that will alleviate the problem.

When that is done, as I think this report points out, there will have to be a reevaluation. If more phosphates have to be removed, then we may have to consider some of the techniques that Mr. Coulter was talking about, as, after secondary treatment, a flocculation and filtering operation to remove additional phosphates.

I think this is the proposal, and their proposal is to try to make do with the existing secondary plants and see how much phosphorus we possible can get out by giving them a fair run under the best operating conditions.

MR. OEMING: Do you like the answer that your attorney gave here?

MR. COOK: I did. I'll enjoy reading that later, I'm sure.

(Laughter.)

MR. OEMING: Recommendation No. 4 states: "All new sewerage facilities be designed to prevent the necessity of bypassing untreated waters."

Would you enlarge upon that a little as to what you mean by "sewerage facilities," first?

Do you mean interceptors, pumping stations, and treatment works, the whole system?

MR. MEGREGIAN: No. This is intended for the sewerage treatment plant itself.

MR. OEMING: All right.

On Recommendation No. 5 here, again we run into this "maximum" business, which apparently gets to be kind of elastic.

What do you mean by "the maximum practicable amount of combined flows to and through treatment plants"? Can you express this in more specific terms?

MR. MEGREGIAN: We cannot pin this down to ratio per volume, because in most cases these sewerage systems are already in place. They already have a volume ratio between the dry weather flow and the stormwater, and so on.

What we are aiming at here is to try to prevent the unnecessary spillage of any combined sewerage or raw sewerage, for that matter, which the system can take to the treatment plant.

MR. OEMING: Then do I understand, Mr. Megregian, that where you have a combined system that is taking the maximum now that the plant can handle, you are satisfied with this?

MR. MEGREGIAN: We are satisfied only to the extent that we can't do much about it right at this moment.

I think the Department of Health, Education, and Welfare has no specific recommendations at this time as to what to do with stormwater overflows. We are embarking on a rather large--

MR. OEMING: You can stop right there. That's all I want to know.

(Laughter.)

MR. OEMING: Also, in Recommendation No. 5, you say: "Combined storm and sanitary sewers be prohibited."

Do you know what improvement will result? And in order to help you with the answer to this question, are you aware of the detailed studies that were made on a separate sewer system in connection with the Detroit River-Lake Erie Project, and the results of that, and what, in terms of pollutants, you get out of a separated system, and so forth?

MR. MEGREGIAN: I am not too fully aware of that particular study. However, I believe that a study of a similar nature was carried out by the Sanitary

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Engineering Center --

MR. STEIN: Let's call on Mr. Harlow for this. A good many of these questions are engineering questions.

Mr. Harlow, will you come up and identify yourself?

As I pointed out before, we have a variety of specialists. Mr. Cook is a biologist, Mr. Megregian is a chemist, and while these people are very familiar totally with the field, I think it is best on the specifics to have someone in the particular field.

As you have probably guessed by now, Mr. Oeming is an engineer, and a very good and a cute one, so we will try to have an engineer answer some of these questions.

Would you identify yourself, please?

MR. HARLOW: For the record, my name is George Harlow. I am with the U. S. Department of Health, Education, and Welfare, and I am the Director of the Detroit River-Lake Erie Project.

Hello again, Mr. Oeming.

MR. OEMING: How do you do, Mr. Harlow. Do you know my question?

MR. HARLOW: I think I do. What you are

inferring here is the comparison of what comes out of a separate system compared to what enters the receiving stream from a combined and separate system.

MR. OEMING: No.

MR. HARLOW: From a combined storm and sanitary system.

MR. OEMING: All right. Will you answer that?

MR. HARLOW: The report that you are referring to is comparing the City of Detroit system with the City of Ann Arbor system, Ann Arbor having a separate system and Detroit having combined.

The record shows that approximately ten-fold or ten times the amount -- I am thinking of coliform bacteria now -- comes out of the combined system as compared to the separate systems, and in addition it indicates that this polluting material that is discharged from a separate system is more animal pollution than it is human pollution. It is still pollution though because it does degrade water uses.

MR. OEMING: My question, Mr. Harlow, is when you have a nice separate system, the separated storm system, would you say this was acceptable in all cases for discharge and would not interfere with water uses?

MR. HARLOW: No, it is not acceptable.

As I recall some figures now from the Ann Arbor system, the report shows that a coliform count is approximately 1,000,000 from the separate system, and this is still a considerable amount.

MR. OEMING: Thank you very much.

MR. HARLOW: I would not recommend that for water contact sports.

MR. OEMING: Thank you very much.

MR. HARLOW: Any more questions?

MR. OEMING: Not any more from you.

I have another one I think for either Mr. Cook or Mr. Megregian.

On Page 4, you make recommendations about filing reports of analyses, and you list a whole series of them, plus some others.

I wonder if you mean this as you say it, or whether these substances would only be reported where they are applicable, or whether they are inherent in the process?

MR. MEGREGIAN: That is what we mean.

MR. OEMING: All right. What in your opinion is the legitimate interest in the information that is in open files by State agencies? Who has a legitimate interest in this besides the Federal Government, I mean?

MR. MEGREGIAN: Those people that have regulatory responsibility.

MR. STEIN: Mr. Oeming, may I say this --

MR. OEMING: I am asking him.

MR. STEIN: I know you are asking him. That is a legal concept and I have answered this before.

In my opinion, a newspaper reporter has a legitimate interest, not just a regulatory agency. We have made that abundantly clear.

MR. OEMING: I think that is all, Mr. Chairman.

MR. STEIN: Thank you very much.

MR. OEMING: Thank you for answering my questions.

MR. STEIN: Yes. Mr. Poole?

MR. POOLE: Well, I have a few. Mr. Oeming covered several that I had jotted down.

My first one is on Page 20 where you refer to this 2,600 square miles of area in the Lake with a low dissolved oxygen.

My question is, does this 2,600 square miles involve interstate portions of the Lake, or is it confined to the Ohio section of the Lake?

MR. MEGREGIAN: The 2,600 square miles is the result of something that is happening through inputs throughout the Lake, and, therefore, to my way of looking at it, it would apply to all of the Lake area.

MR. POOLE: In other words, you class it as an interstate problem?

MR. MEGREGIAN: I am no lawyer in this case, but I certainly do, yes.

MR. POOLE: My next question, and Mr. Oeming referred to this, is on the statement you have on Page 25, at the bottom of the page, with reference to industrial waste data that had not been made available for computation.

My question is, does this involve data from Indiana industries?

MR. MEGREGIAN: No, sir. I believe the Indiana Department of Water Pollution Control, or the Stream Pollution Control Board has made the data available to us as we needed.

MR. POOLE: Thank you. I thought we had. I just wanted to be sure.

Now, I don't want to start beating this phosphate removal thing around again. It has occupied a good portion of the questioning part of the afternoon.

I candidly have some personal misgivings about the 65 per cent removal by secondary treatment plants, and I want to be sure from you, Mr. Stein, that your definition or your answer to Mr. Oeming's question prevails.

As I understand your answer, you were saying that rather than the 65 per cent, which is documented on Page 28, that it was the intent of HEW that all of us who have secondary treatment plants operate them to the maximum efficiency that we can get out of them for phosphate removal.

Is that correct now?

MR. STEIN: That is as I understand the investigators, yes. This is what they meant by that.

MR. POOLE: I wanted to get that clear.

We have some sewage treatment plants in Indiana where, by a major redesign and major additions or rebuilding of the treatment plant, we might accomplish the 65 per cent removal, but I am very skeptical about our being able to do that without what I would classify a major overhall to at least the sludge removal into the sewage treatment process.

MR. STEIN: I couldn't agree with you more. This is my personal view too.

As a matter of fact, if you had to do that, it might pay to get to the flocculation business, and it might be a lot cheaper than tearing down an existing secondary plant and rebuilding it. What I was trying to do was clarify what I think the intent and the thrust of this recommendation of the investigators is.

MR. POOLE: My question now, and I don't want to belabor this Michigan situation, and I guess, Mr. Stein, this question is addressed to you more than to the men over on the end, is, I am a little bit confused in that I am aware of the June conference in Detroit, and I have a copy of the conclusions that the conferees agreed to.

The part where I am just a bit confused is that I had assumed, when I came here as a conferee on Lake Erie, that we were to include in our deliberations the Michigan load, just the same as the Indiana load and the Ohio load, the New York load, and the Pennsylvania load.

I am correct in that assumption, I hope?

MR. STEIN: Yes. I don't see how the facts of the situation would permit otherwise.

MR. POOLE: I don't want to go back to the Michigan conclusion, but I am not sure that there is complete harmony. Maybe there is, and we will deliberate on that later on.

I just want to be sure there is complete harmony between the Detroit conclusions and the recommendations that are made for the rest of us that are involved in Lake Erie.

MR. STEIN: I would hope this would prevail.

I think the answer about the load is answered by geography for us. The Detroit River flows into Lake Erie, as well as the Cuyahoga and the other rivers, and it contributes to the load.

The correction we made here obviously referred to the statement that the Michigan Water Resources Commission didn't agree to anything at the Detroit conference. The conferees agreed to that, and that has been corrected.

I would hope that the conferees would adopt recommendations here which would be compatible with and consistent with the recommendations made at Detroit.

MR. POOLE: This next question is directed to Mr. Cook.

Mr. Cook, the best we could determine is that we had 2,500 to 3,000 pounds of phosphates that are added to the Maumee River at Fort Wayne. It is 135 miles from Fort Wayne, Indiana, down the Maumee River to Lake Erie.

My question is, what happens to those Indiana phosphates? Do they all show up as a part of this Lake Erie total, or are they used by this prolific algae growth that you referred to in the Maumee long before they get to Lake Erie?

MR. COOK: Well, Mr. Poole, this is an extremely complex situation, as you know. Certainly, those nutrients do develop some very intense algal blooms of a most undesirable quality, namely the blue-greens, which cause noxious odors and taste in drinking water.

The fact that they are taken up by the algae and probably almost reduce it from the water is only a temporary thing, however. The algae, as they dry off, release these phosphorus materials so that they again become dissolved in the water and move on down the stream. Not all of them do, and I am not prepared to say how many or what percentage, but it is somewhere between 5 and 95 per cent, I guess.

That is about the best we can say about it, but I am reasonably sure that some of the phosphorus material entering the river at Fort Wayne and New Haven does find its way eventually into Lake Erie.

MR. POOLE: Not being a biologist, I can't contest that answer.

(Laughter.)

MR. POOLE: I have another question of one of you, and that is, did you collect data on the Maumee, and, incidentally, on the St. Joseph and the St. Marys at or near the Indiana-Ohio line?

I note that in your report there was no reference made to the condition of these rivers at the State line.

MR. MEGREGIAN: Not at the exact State line. Our sampling stations were at Antwerp, or near Antwerp, Ohio, which is on the other side of the line, perhaps about ten miles.

MR. POOLE: Of course, you have a station just inside the Indiana border, where you collected some data as a part of the Maumee survey?

MR. COOK: No, sir.

MR. POOLE: Now, on Page 57 of Part 2, you referred to two plating plants in Fort Wayne, Indiana, which contribute large amounts of cyanide and heavy metals. Then you go ahead and document it with 38 pounds from one company, and later on in a table you refer to the 38 pounds again.

I did a little mental arithmetic, and the absolute minimum river flow is somewhere in the vicinity of 38 million gallons a day. This would be a pound of cyanide for a million gallons of river water, or less than a tenth of a part per million.

It seemed to me you were laying it on a bit heavy when you were talking about large amounts of cyanide. I wondered if that tenth of a part per million wouldn't have disappeared in a very short distance as it went down the river.

What do you think?

MR. COOK: Well, Mr. Poole, it is very difficult finding major contributors in Indiana, and I think this is why it has worked its way in.

(Laughter.)

MR. POOLE: Thank you.

MR. COOK: Certainly you are right.

MR. POOLE: I almost withdrew that question after I found you referring this morning to a Federal installation that had only two employees. I will admit it is not quite fair to you.

(Laughter.)

MR. STEIN: You know, we have been through this before, Mr. Poole. One thing we do is take them big and small, as you well know.

Mr. Poole has been through this with us on hearing boards and in cases before. We have found the most difficult thing is to make a cutoff as to who is a significant polluter and who is not, and the only way we have been able to resolve this is to take them all.

One thing we don't do, no matter how large the city is or how large the industry, we don't hesitate to call them in too, but then we get to the other end of the telescope and we come up with a water closet.

MR. POOLE: I think those are all the questions I have, except for the benefit of you who may study the report, we can't find that 10,000 people in five unsewered communities on the St. Marys River. I think there is something wrong with that figure.

That is the end of my questioning, Mr. Chairman.

MR. COOK: Thank you, Mr. Poole.

MR. STEIN: Is there any comment on that last statement?

MR. COOK: We will check into that. There may be an error someplace.

MR. STEIN: Thank you. Mr. Boardman?

MR. BOARDMAN: The formal statement for Pennsylvania will be presented at the second session of the conference that will be held in Buffalo, New York.

I would like to make a couple of comments and ask some questions about the conclusions that were presented today, since we won't be able to represent ourselves in any other way today.

This matter that Mr. Poole and Mr. Stein were discussing, about small sources of pollution and large sources of pollution, is quite appropriate, because if you look at the map you will see Pennsylvania is a very small share of the basin land area, although by reading the Summary and Conclusions in the report this isn't very apparent.

When I first looked at it and saw Lake Erie and the tributaries were polluted, the first question in my mind was, were all the tributaries polluted, and I would like an expression from Mr. Cook or Mr. Megregian about what percentage of the tributaries from Pennsylvania are polluted, or are they all polluted?

This is one question I have.

MR. MEGREGIAN: We are getting ahead of ourselves. We intend to read that part of the report next week.

MR. BOARDMAN: The reason I asked the question is because the conclusions were read today, and it stated that the tributaries and the Pennsylvania streams are polluted.

I would hate to see the audience here go home and say that Pennsylvania has a real pollution problem in Lake Erie. We don't think we do. As a matter of fact, I am somewhat surprised at some of the conclusions that were arrived at. But this is why I asked.

I might point out that in Part 3, if you look at the Pennsylvania section, we talk about trout fishing and a number of other activities in the tributaries in the Pennsylvania part of the basin.

MR. COOK: Mr. Boardman, your situation is somewhat similar to Indiana's.

We recognize that the State of Pennsylvania has done a good job in that part of the State, and probably throughout the State. However, you will agree, I am sure, that there are some polluters there, and we hopefully will get those taken care of.

Perhaps we will go into more detail next week.

MR. BOARDMAN: Right. I am sure you will. We do have some localized problems, and we hope that our Department of Water Works is taking care of them.

Down on Page 1 where you indicate the discharge of municipal and industrial wastes in Michigan, Ohio, and the others, are endangering the health and welfare of persons in other States than those in which they are originating, I think it was pointed out that here we are talking about phosphates.

Is that correct?

MR. COOK: That is correct.

MR. BOARDMAN: And also, further back in the report, on one of the tables, you indicated that Erie would remove 1,200 pounds of phosphate.

Does this mean that there would be no interstate pollution there from Pennsylvania?

MR. COOK: It would certainly help.

MR. BOARDMAN: This is the point that bothers me. On what basis was this statement made? By measured phosphate levels in the waters in the Pennsylvania portion of the basin, or is this a generalized statement just saying that there are phosphates contributing to the basin, so everyone is causing pollution?

MR. MEGREGIAN: This is part of the total contribution to the Lake, which can be effectively controlled by a concerted effort by all of the input sources.

MR. BOARDMAN: But is this considered to be made on specific chemical indicators, levels of phosphates in water, or is this just a general conclusion?

The point I am getting at is, could we go to Erie and say, "Fellows, if you remove this much phosphate, Pennsylvania will be contributing no more interstate pollution to the waters of Lake Erie"?

MR. MEGREGIAN: No, I don't think that means that at all. I think that it means that Pennsylvania, and every other contributor of phosphate to the Lake, will always have to concern itself with how much it may have to remove today and perhaps tomorrow or sometime in the future as these loads increase.

It isn't the per cent removal that matters, but it is how much in pounds can the Lake itself tolerate and remain in a suitable condition.

MR. BOARDMAN: I understand this. If we were talking about cyanide, you could tell Erie that, okay, you would have to remove a certain amount and you can only discharge so much cyanide, but this is the question I am raising.

Do you have the information to tell Erie or any other of our municipalities how much phosphate they can discharge and not --

MR. MEGREGIAN: I don't think we would be in any position to tell them that. I think that we would say specifically that Erie should do the best it can under the conditions that it has available to it right now.

MR. BOARDMAN: May I go one step further?

Do you know how much phosphate the Erie secondary treatment plant is removing now?

MR. MEGREGIAN: We do not know how much it is removing now. These calculations were based on population equivalents.

MR. BOARDMAN: I don't see how you can say that there is interstate pollution being caused from Pennsylvania.

This point bothers me, and I am sure it will be explored further next week, but I think there is very little fact to back up the conclusions that are made in the report.

I have one more brief comment, if we can skip over to Page 2, which is Pennsylvania's paragraph evidently in the report.

We are getting down to some pollution problems in Pennsylvania that Mr. Cook has thrown his hands up to say that we don't know what to do with reference to them. I think he threw his hands up at the combined sewer overflow, land drainage, and also accidental spills and wastes from lake vessels.

I think that this paragraph, even though it says Lake Erie and the tributary streams in the Pennsylvania basin are polluted, the remedial measures necessary to remove this pollution are in the area of the unknown, and that evidently, even though the report doesn't say it, our municipalities and industries have done a good job in water pollution control in the Lake Erie Basin.

That is all I have, Mr. Stein.

MR. STEIN: All right. Do you have any other comments on that?

MR. COOK: No, I haven't.

MR. MEGREGIAN: It sounded like an editorial that he wanted to put in. I have no comment on it.

MR. BOARDMAN: May I clear up a point?

It may be a statement that looks good in this report, but when our newspapers in Erie pick up this report and print it, and ask the Department of Health why it is doing such a bad job, then it comes back to haunt us, and I don't think this is the case.

MR. COOK: I am sure, as I said before, we can get more detail on this in Buffalo next week.

MR. STEIN: Mr. Hennigan, do you have any questions or comments?

MR. HENNIGAN: Like Pennsylvania, most of our comments and presentations will be made next week in Buffalo.

However, I would like to point out that New York, as far as Lake Erie is concerned, is the downstream State, that the Niagara River is not a tributary to Lake Erie, and that in terms of percentages of total loads into Lake Erie, the New York State contribution in practically every instance will be in the neighborhood of one per cent or less, which will be more fully developed at the Buffalo meeting.

MR. STEIN: Thank you, Mr. Hennigan.

Who wants to speak for Ohio, either or all?

DR. ARNOLD: We have a couple of questions.

MR. MORR: We have several lines of inquiry.

I am Fred Morr, Director of the Department of Natural Resources.

I should like Mr. Cook to refer to a letter from Assistant Secretary James M. Quigley, Department of Health, Education, and Welfare, dated April 22, 1965, in which he says, and I quote:

> "Our report, studies and surveys indicate that extensive pollution is occuring in Lake Erie. They have not demonstrated that this pollution is in fact interstate in nature within the meaning of the law."

And now this report, of course, dated July 1965 does establish on Page 1, Paragraph 6 that, and I ask is this a conclusive finding, as our conferee from Pennsylvania said, discharges of municipal and industrial wastes originating in Michigan, Indiana, Ohio, Pennsylvania, and New York are endangering the health or welfare of persons in States other than those in which such discharges originate?

Have we stablished that there is interstate pollution in Lake Erie irrevocably and conclusively?

MR. COOK: The answer is yes.

MR. MORR: We have? With this in mind, and since this is interstate, may I refer you to the bottom of Page 24 for a moment?

You state, in the last paragraph:

> "Approximately 79 per cent of the total municipal waste in Ohio-Lake Erie Basin receives secondary treatment."

Then we find at the top of Page 25 that only 11 per cent of the total population receives secondary treatment.

We then move to Page 27, and under "Nitrogen Compounds," we find that the largest input is the Detroit River, and other major sources are the Maumee and Cuyahoga Rivers, and the industrial and municipal discharges at Toledo and Cleveland.

We then go to the last sentence on Page 27, which states:

"However, the institution of secondary treatment will significantly reduce nitrogen inputs and thereby aid in the control of local problems as well as total inputs to the Lake."

Then at Page 28, under the "Soluble Phosphate" finding of the Public Health Service, in the second to the last paragraph, it states:

"A 65 per cent reduction of phosphate inputs can be achieved through secondary sewage treatment, operated to effect optimum phosphate removal. Secondary treatment provides additional benefits through greater reduction of oxidizable organic matter, disease-causing organisms, phenolics, nitrogen, and other waste materials."

Now, then, referring to the listing, you state Detroit may reduce by 45,500 pounds. You then mention Toledo. Here, you might note, we already have secondary treatment begun, so there is a possible error here in your listing.

At Toledo, and moving down to Sandusky, Lorain-Avon, Lakewood, Westerly, Easterly, Euclid and Erie, I would like to point out that Easterly Cleveland has already begun secondary treatment.

Computing this, we have 63,600 pounds reducible per day, and with Michigan contributing, according to your figures, some 63,500 pounds of the total, and using the total 62,600 -- and I go through these figures rapidly because this is not my main query, but I think the record shows it -- this would indicate that today we might reduce 62,600,000,000 pounds of algae per day.

Assuming then that these figures are correct, and I am using Mr. Cook's one pound of soluble phosphate removing one million pounds of algae, might it then not be wondered why -- and herein lies my query -- why do not the recommendations, in the light of these citations and conclusions, found in Part 2, Pages 69, 75,79, 87 and 95, include the secondary treatment facilities when, according to Page 29 of the report, Part 1, that should be given top priority, and which would provide significant, and I am quoting from Page 29, improvements in the water quality in Lake Erie observable within a few years?

This is what we saw in Ohio, observable within, in your conclusions, a few years, significant improvement in the water quality in Lake Erie.

Do you understand my query?

MR. MEGREGIAN: I think I have tried to follow your question.

I think the first point we want to make here is that the corrections that are listed on Page 28 with respect to the phosphate removals from these various plants did take into account the secondary treatment already existing, and the point here is that we are certain that most of these plants were not operating to effect maximum phosphate removal, but were operating to effect perhaps normal BOD reduction, without concern for phosphates.

MR. MORR: My question is why was not secondary treatment conceived, since you gave it such top priority as being needed? Why were not secondary treatment recommendations made?

MR. STEIN: Sir, in the interests of time, if you look at Page 3, as I understand the format of the report, and I have no brief for the format, but here is what they say:

They came up with a general recommendation that municipalities be given secondary biological treatment.

All the other places that you cited, as I read the report, assume that the secondary treatment will be given, and they are in addition, but they have recommended secondary treatment for all municipal wastes.

Is that correct?

MR. MEGREGIAN: That is correct.

MR. STEIN: And I think that, in answer to your specific question, they did recommend it.

MR. MORR: Yes. You did, I understand, but we have a great sensitivity, if I might say so, in the recommendations leading toward improvement of industrial treatment and municipal treatment, and I was just trying to bring into play here or into the discussion or into explanation the failure to perhaps give sufficient attention to secondary treatment in our sewer treatment facilities in Ohio and in Michigan, and perhaps the other States, when top priority, at Page 29, is given secondary treatment.

I just wondered, was there an attempt to equalize the effect of industrial wastes and sewage treatment?

MR. MEGREGIAN: As far as I can understand what you are trying to say, we have no intention of minimizing the need for secondary treatment anywhere in the basin.

MR. MORR: It is very necessary, and needs top priority, according to your conclusion on Page 29.

MR. MEGREGIAN: That is correct.

MR. MORR: Thank you.

MR. STEIN: Are there any further questions?

Go ahead, Mr. Eagle.

MR. EAGLE: I am George Eagle from Ohio.

I would like to go back to this table on Page 28 again. Could you explain to me just how you arrived at these figures of 2,900 pounds in the case of Toledo, and 6,800 pounds in the case of Easterly?

Is this based on 65 per cent reduction?

MR. MEGREGIAN: Mr. Eagle, where the present treatment was already secondary, we assumed that this plant was removing 35 per cent, and through additional controls could probably increase its removal up to 65 per cent.

Where the treatment plant is presently

primary, we expected the secondary treatment then to remove 65 per cent.

These figures are based on population equivalents of phosphate, rather than exact measurements from the effluents of these cities.

MR. EAGLE: Then, going back to your Recommendation No. 2 on Page 3, about what you mean in lieu of phosphates, you mean 65 per cent then?

MR. MEGREGIAN: I'm sorry?

MR. EAGLE: Would you mean Recommendation No. 2 on Page 3?

The question was asked you a while ago what you meant by maximizing the removal of phosphates. You are using 65 per cent as your figure?

MR. MEGREGIAN: That is correct.

MR. EAGLE: Then if they don't remove 65 per cent of the phosphates, we will be expected to do something about it?

MR. MEGREGIAN: I don't think that is quite correct, Mr. Eagle.

MR. EAGLE: All right.

MR. MEGREGIAN: I think that if the plant can demonstrate that this is the best it can do without extensive increases in capital investment and other engineering devices, we would be satisfied.

MR. EAGLE: Well, I would like to go to Page 85.

In the fourth paragraph, you say there are 20 known industries that discharge to the Greater Cleveland Lakefront.

We would like to have a list of those 20 industries. We would like to know where they are and who they are, because, to the best of our knowledge, we do not have them.

This can be for a later time, but we would like to have that list.

MR. MEGREGIAN: We will provide it.

MR. EAGLE: Going down now to the next to the last paragraph, where you say that the City of Cleveland has approximately 383 combined sewer overflow structures, and so on, and talking about the 250 additional overflow devices, and so on, this is indicated to be a very bad situation.

Where is this reflected specifically in your recommendations, what should be done about this situation?

MR. MEGREGIAN: The recommendations for Cleveland?

MR. EAGLE: Yes.

MR. MEGREGIAN: The controlling of the storm-water overflows to maximize the return of all wastes to the city treatment plant.

MR. EAGLE: I think there is a little more to it than that.

MR. MEGREGIAN: Yes, and the development of a master sewerage plant to take more.

MR. EAGLE: But I understand that was taken out by Mr. Stein, is this correct, that you did not have the authority to recommend?

MR. STEIN: Yes, to recommend a regional organization.

By the way, now that you brought this up, I don't think this is any different with the State than with us. You don't go into any community and tell them what kind of regional organization to set up.

MR. EAGLE: No.

MR. STEIN: And our authority on that is precisely the way yours is.

MR. EAGLE: That is right.

MR. STEIN: We can't, and I don't think it would be appropriate, under your law or our law, for us to even think about it.

MR. EAGLE: Well, I noticed you were very specific with regard to Defiance about correcting their sewerage situation, and so on, but you were not specific in this regard with Cleveland and some of the other areas where they have different problems.

I just wish to point out that which I consider to be a deficiency in the report.

I think that is all I have.

MR. STEIN: Mr. Eagle, again, I will try to explain what these fellows have done.

In trying to shorten their report, they have used a word that engineers love -- extrapolated. They have taken out general conclusions, so they didn't have to repeat them for each city.

Part of this general conclusion, as I understand it, is full secondary treatment for all municipal wastes. It is not because of lack of emphasis that they didn't want to keep repeating this over and over again.

Presumably this is the recommendation they are making for Cleveland. Is this correct?

MR. MEGREGIAN: Absolutely.

MR. STEIN: You might want to pursue this, but I think this is the point. The point is they made this on Page 3 and they didn't say it again. They just said it generally, and this applied every place you see a municipality, large or small.

MR. EAGLE: Thank you.

MR. STEIN: Are there any other comments or questions?

MR. HENNIGAN: Could I make a comment, Mr. Chairman?

MR. STEIN: Certainly.

MR. HENNIGAN: I get the impression from the presentation and going over some of the material, that the major pollutional situations and the toughest problems are centered in the major urban centers around the shore of the Lake, Detroit, Toledo, Cleveland, Erie, and the Buffalo-Niagara frontier.

Is this a valid conclusion? I mean, did I reach a valid conclusion?

MR. MEGREGIAN: I don't believe there is any doubt about it.

MR. HENNIGAN: Good. Thank you.

MR. STEIN: Are there any further comments or questions?

(No response.)

MR. STEIN: Again, given our experience on this, I think we have reached the point of diminishing

Grover Cook and Stephen Megregian returns for one day.

We will stand recessed until 9:30 tomorrow morning, same place.

(Whereupon, at 5:50 p.m., the conference was adjourned until Wednesday, August 4, 1965, at 9:30 o'clock a.m.)

WEDNESDAY, AUGUST 4, 1965

9:30 A. M.

MR. STEIN: May we reconvene? Mr. Oeming.

MR. OEMING: Mr. Chairman and Conferees:

During the presentation of the Federal report yesterday, there were quite a few modifications and some corrections indicated by the discussion, and I would like the Chairman to rule on how these will be taken care of in the transcript of the testimony of the conference.

MR. STEIN: First, I want to thank Mr. Oeming for his exhaustive review, and I think yesterday we saw, at least to my mind, the American system of democracy in operation, where one group puts out a statement, we subject that to public view and discussion, and get that corrected.

I think very many significant corrections were made by Mr. Oeming, and the transcript and report will reflect these corrections. I think all the conferees should be thankful to Mr. Oeming for perfecting the record and certainly, in my mind, making that a significantly better report.

Thank you, Mr. Oeming.

MR. OEMING: Thank you.

MR. STEIN: Mr. Poston. I wonder if we could call on Mr. Poston for a continuation of the Federal presentation.

MR. POSTON: In line with procedures set forth for the conference, we have invited other Federal agencies that have interest in these matters of water pollution to make known their ideas on this and give a statement.

First, this morning, I would like to call on Colonel R. Wilson Neff, District Engineer of the Corps of Engineers, from Buffalo, who will make a statement at this time.

STATEMENT OF COLONEL R. WILSON NEFF, DISTRICT ENGINEER, U. S. ARMY ENGINEER DISTRICT, BUFFALO, NEW YORK

COLONEL NEFF: Mr. Chairman and members of the conference, ladies and gentlemen:

I welcome the opportunity to outline to you the responsibilities of the Corps of Engineers and the interest of the U. S. Army Engineer District, Buffalo, in the very challenging problem of preventing pollution of Lake Erie and its tributaries.

The Great Lakes drainage basin is under the jurisdiction of the U. S. Army Engineer Division, North Central, with headquarters in Chicago. Within this area the Buffalo District is responsible for the construction, maintenance, and operation of improvements authorized by Congress for navigation and flood control of the watershed area from Sandusky Harbor, Ohio, to the east. The U. S. Army Engineer District, Detroit, is responsible for the area north and west of the Port Clinton-Marblehead peninsula. It is important to note that the Corps of Engineers is involved in both regulatory and operational

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activities. I will first discuss our

REGULATORY ACTIVITIES

The laws administered by the Corps of Engineers provide for the protection of navigable capacity of the waters of the United States and the prevention of pollution of such waters as may be necessary to protect the public rights of navigation. The principal laws having a relationship to water pollution are the Rivers and Harbors Act of 1899 and the supplemental Act of 3 March 1905. Section 10 of the 1899 Act provides for the regulation of construction, excavation and filling in navigable waters. Section 13 of this Act makes it unlawful to deposit "refuse matter of any kind or description. . . " into any navigable water. Section 4 of the 1905 Act authorizes and empowers the Secretary of the Army to prescribe regulations to govern the transportation and dumping into any navigable water, or waters adjacent thereto, of dredging, earth, garbage, and other refuse materials of every kind or description, whenever in his judgment such regulations are required in the interests of navigation. Though the Oil Pollution Act of 1924 is not applicable to the waters of the Great Lakes, it has been held that oil discharged into navigable waters per se is a violation of Section 13 of the Act of 1899 (LaMerced, Circuit Court of Appeals, Washington, 84 Fed. 2nd 444).

Specifically exempted from regulation under Section 13 of the 1899 Act are liquid wastes, other than oil as held above, passing into navigable waters from streets and sewers. Liquid industrial wastes, although they may be pollutants, are not violations of the River and Harbor Act of 1899 if they reach the water through sewers. In addition, the complexity of many sewer systems renders the securing of necessary evidence to enforce existing regulations a most difficult task.

The Corps of Engineers, in the administration of the laws, attempts first of all to eliminate illegal deposits by encouraging industries to improve their treatment of wastes, or use confined shore disposal. If this is unsuccessful, or technologically infeasible, the industry is requested to remove, or pay for removal, of its illegal deposit. In the event of refusal to remove the deposits, prosecution is recommended when supporting evidence is obtainable. Since the primary purpose of these statutes is to protect navigation from obstruction and injury, enforcement has been concentrated on the prevention of illegal deposits, including oil, that will impede or injure navigation.

Legal recognition of the responsibility of industry with regard to the deposition of industrial solids by steel companies has been reviewed in other conferences on this subject. In brief, this involved the successful enforcement of the Act of 1899 regarding the depositing of flue dust in the Calumet River, Illinois, by three major steel companies. Following appellate court decisions granting a new trial in favor of the Government, and after some nine years of litigation, the case was dismissed pursuant to a stipulation with the Government, wherein the steel companies agreed to pay annually for the removal of flue dust deposited in the Calumet River as a result of their operations. Additional investigations are now being undertaken in view of this precedent.

Other efforts toward pollution abatement by the Corps of Engineers are the periodic issuance of the regulations pertaining to pollution in the form of a public notice which also contains a reference to the applicable statutes and an invitation to the public to report all violations and a follow-up on all complaints.

Now let us turn briefly to our

OPERATIONAL ACTIVITIES

Procedures and practices of the Corps of

Engineers involving the construction and maintenance of navigation structures and channels, flood control works, and other public projects seek to preserve the rights of many interests involved in the use of our water resources. This includes all aspects of navigation, industrial use, recreation and conservation.

Recently, there have been a number of charges regarding the dredging practices of the Corps. The need for maintenance of river channels and harbors and our lakes and harbors seems to be clearly established. Many great industrial centers began and flourished simply because of their proximity to waterborne transport.

Annual maintenance dredging here in Cleveland Harbor, which was brought up yesterday, including the Cuyahoga and Old River Channels amounts to about 1,200,000 cubic yards at a cost each year of approximately 1 million dollars. This material is deposited lakeward of the east breakwater. It is recognized that the deposition of dredged material outside the breakwater affects localized sedimentation rates but there is no evidence that these operations have been detrimental to shore installations or beaches. Any pollutants from the rivers and harbors which may be deposited in the lake

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by dredging would eventually be carried out by a natural current action.

While the dredging and disposal operation may accelerate the movement of solids and to a minor extent, liquid wastes, it does not add pollutants to the waters.

A decision to curtail the use of Lake Erie for disposal would require the availability of alternate areas if deep draft navigation is to continue to serve the states involved. There exists the possibility of the disposal of dredged materials behind dikes or bulkheads. This is being accomplished in the Detroit and Toledo areas; however, in both these areas, this method of disposal is more economical than hauling the material long distances for disposal in deep water in the lake. Within a densely populated metropolitan area as we have in Cleveland where land filling areas are scarce, the cost of such an operation does not compare favorably with lake dumping. One estimate utilizing the extension to the Burke Lake Front Airport indicates an additional cost above that normally required for maintenance dredging of $1,750,000, and the disposal area would be filled in about two years. In accordance with the present practice, local interests would be required to assume this additional cost. One aspect, not considered in this estimate, is whether or not the dredged material would make suitable fill material.

I might add at this point that the information placed in the record yesterday regarding work being performed in Lake Michigan with the Corps does not agree with the facts that I have. Our Chicago District states that a permit for filling behind bulkheads in the East Chicago Harbor and Indiana Harbor, Indiana, have been issued by that office. In both cases, the areas are being used entirely for the disposal of slag from the steel companies and no dredging is involved. These operations are being performed entirely by private interests.

The shore disposal at Toledo has been accomplished by direct pump out of the Hopper Dredge MARKHAM which is based here in Cleveland and operated by the Buffalo District. The Hopper Dredge HOFFMAN, also based here in Cleveland and operated by the Buffalo District, is being modified this fall in order to be able to perform the same operation in the Rouge River near Detroit. It should be noted that any pollutant in liquid form is not eliminated by this type of disposal since dilution water must be drawn off during the disposal operation.

To summarize, it appears that future disposal of most dredged material will of necessity continue to be in Lake Erie, and that control of the spread of pollutants must come through the elimination of the sources of pollution. Since most forms of pollution reach navigable waters via sewers in liquid state and do not cause any obstruction to navigation, the Corps of Engineers does not have a clear basis for attempting to eliminate them.

From my office in Buffalo, where I observe the Niagara River and its inexorable flow which averages some 130 billion gallons per day and in 957 days is equivalent to the total volume of water in Lake Erie, one is impressed by the natural forces which are operating to assist in keeping the water clean. In the interest of economy it would appear wise to take advantage of these natural forces and the application of pertinent statutes and foresight to accomplish the desired end of reducing pollution.

Thank you.

MR. STEIN: Thank you, Colonel, for an excellent presentation and description of the Corps' work. As you know, the Corps and we and certainly the other Federal agencies are assisting in the Federal Water Pollution Control Program, but the Corps of Engineers and we have another bond because of all the agencies, both the Corps and we go before the same Committees of the Congress for our legislation and review, so, as you can see, we work together more or less like Siamese twins.

Are there any questions or comments from the panel?

(No response.)

MR. STEIN: If not, thank you very much, Colonel.

MR. POSTON: I would like to call on Mr. K. L. Kollar, Director of Water Industries and Engineering Services Division of the U. S. Department of Commerce.

Mr. Kollar is from Washington, D. C. and represents the Department of Commerce. I neglected to include him in the list of names yesterday morning as one of the Federal representatives who wishes to be heard.

Mr. Kollar.

STATEMENT OF
K. L. KOLLAR, DIRECTOR
WATER INDUSTRIES AND ENGINEERING
BUSINESS AND DEFENSE
SERVICES ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Mr. Chairman, Conferees, Ladies and Gentlemen:

I am K. L. Kollar, Director of the Water Industries and Engineering Services Division, BDSA, U.S. Department of Commerce.

The Department of Commerce has spearheaded a nationwide drive to modernize U.S. industry over the past two years. Briefly, the purpose of this drive is to improve our competitive position in the engineering one-world market, and to increase our rate of economic growth.

It is not necessary to present Department of Commerce statistics which indicate that our economy is strong. Nor is it necessary to show that we cannot stand still. We must continue to increase productivity, lower costs, decrease unemployment, and increase consumer buying if we wish to compete profitably in today's and tomorrow's market and leave the same legacy of opportunity for our children and grandchildren. Part of the answer rests in modernization.

Certainly this Administration has provided incentives and laid the groundwork for greatly increased economic activity with the $11.5 billion tax cut, the liberalized depreciation regulations, and the investment tax credits. These measures have been instrumental in pumping more cash into corporate coffers for expansion and modernization.

The Government can only set the stage, while business initiative, ingenuity, and enterprise, powerfully stimulated by the profit motive, are always the factors most responsible for our economic growth.

Modernization generally brings to mind plant production equipment and the associated economic benefits in addition to finance and research development.

One of the most important benefits could be the effect on water.

The Department of Commerce would like to emphasize to this Conference that great water pollution control benefits can accrue from modernization. Modernization could decrease water use by conservation, recirculation, reuse, multiple use, and stepped up use, while water pollution could be decreased by reclaiming wastes and preventing leakage and spills.

Pollution need not always be controlled by treatment. It could involve diligent process control, employee education, and recovery systems, which in a way, are part of modernization. Companies spend money to study and survey efficiency of organization, operation, and production. Considerable savings can be effected from surveys of in-plant water use and sources of pollution for the purpose of minimizing both. Time does not permit recounting cases where companies, acting on their own initiative and with an eye to the future, have developed programs which will create very few problems to the enforcement of water pollution control laws.

This short presentation has emphasized some of the industrial aspects of water pollution, since the Department of Commerce has the responsibility for assisting and advising businessmen and acting as liaison between business and the Federal Government.

Industry has already invested hundreds of millions of dollars on control and abatement facilities.

These investments support the objective of President Johnson's message to Congress on "Natural

Beauty of Our Country" in which he charged municipalities as well as industry "....to organize for action and rebuild and reclaim the beauty we inherited".

It is therefore incumbent on local government and industry to continue working hand in hand to solve pollution problems where they exist.

Thank you.

MR. STEIN: Thank you, Mr. Kollar, for a concise statement.

(Applause.)

MR. STEIN: Are there any comments or questions?

Mr. Morr.

MR. MORR: Mr. Kollar, you represent the Business and Defense Services Administration?

MR. KOLLAR: Yes, sir.

MR. MORR: In the fourth paragraph, you state:

> "Certainly this Administration has provided incentives and laid the groundwork for greatly increased economic activity."

I suppose you refer to the Business and Defense Services Administration?

MR. KOLLAR: No. I mean, the Federal, the Government, the Administration of the Government, the total Government. Really, these are tax laws of the public Treasury Department of the United States, but the Department of Commerce is instrumental in seeing that some of these tax facilities were given to the industries.

MR. MORR: Do you want to change that statement then to the Department of Commerce?

MR. KOLLAR: Well, it is the Government Administration. If you want to call it the Johnson Administration, you can.

What I am really saying is it is not really Business and Defense Services Administration. Is that your question?

MR. MORR: I just wanted to get that. Thank you very much.

MR. KOLLAR: The total Government is what I am referring to.

MR. MORR: I see. Thank you.

MR. STEIN: Thank you, Mr. Kollar. Are there any further comments or questions?

(No response.)

MR. STEIN: If not, thank you very much, sir.

Mr. Poston?

MR. POSTON: Next I will call on Mr. Fred Wampler, Regional Coordinator of the Appalachian program, who will present a statement for the Department of the Interior.

Mr. Wampler, I understand, has additional statements from the Bureau of Commercial Fisheries, and he will call on others.

STATEMENT OF MR. FRED WAMPLER, REGIONAL COORDINATOR, U. S. DEPARTMENT OF THE INTERIOR

MR. WAMPLER: Mr. Stein, distinguished members of the Panel, and gentlemen:

I am Fred Wampler, Regional Coordinator, Ohio River-Appalachian Area, U. S. Department of Interior, and it is a pleasure to participate in this conference.

In fact, it is, for the simple reason that it enables the Department of the Interior to express the Secretary's desire to sort of nationalize the Department of the Interior and extend their activities beyond the Mississippi River, and this is a pleasure.

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Also, it has brought back about 34 years of memory, when I made my debut as a football coach in the State of Ohio. There was a lad on my team, a stellar player, very versatile, agile, prudent, and had the ability to lead.

I apparently followed him very little, until I came to Cleveland yesterday, and I find that the Honorable Mayor of the City of Cleveland, Ralph Locher, had the opportunity to unite again with his former football coach.

I'm awfully sorry, Mr. Chairman, that we had to pollute Lake Erie and its tributaries to reunite a couple of old cronies.

(Laughter.)

The Department is pleased that the States of Indiana, Ohio, Pennsylvania, New York, and Michigan are concerned in the matter of pollution of the interstate and Ohio intrastate waters of Lake Erie and its tributaries.

The broad interests of the Department of Interior in water quality and related problems in Lake Erie is reflected in the Department's Agencies represented at this conference. While each of these agencies has its own program, the Department exercises the administration necessary to assure that all programs are coordinated to avoid duplication and to achieve results.

Water, the problems and opportunities it carries, ignores State, Regional and even International boundaries. It is important that the inter-relationships of water be so recognized, and that State, Federal, and local government agencies charged with various aspects of water management and development work harmoniously in solving these many problems.

The Department of Interior and the many agencies in it dealing with water problems, remains ready to fulfill its responsibilities to the States and the Nation.

Therefore, I will call on Mr. Charles Collier, the Assistant District Chief for the Ohio District for Water Resources, U. S. Geological Survey, out of Columbus, who will give you a brief outline of the concern of that agency in the matter of pollution of the interstate and Ohio intrastate waters of Lake Erie and its tributaries.

Mr. Collier.

MR. STEIN: While Mr. Collier is coming up, I should tell you that Mr. Wampler is really modest. He has been interested in water for a long time.

After he was a coach, as many of you people know, he went to Terre Haute, Indiana, in Blucher Poole's state, and had a distinguished record as Congressman from Terre Haute, Indiana, with their interest in water pollution problems, and then he was associated with the Wabash River Interstate Compact.

So we indeed have an old friend and an expert, and in Mr. Wampler, to me at least, a former boss.

STATEMENT OF MR. CHARLES R. COLLIER, ASSISTANT DISTRICT CHIEF, U. S. GEOLOGICAL SURVEY, COLUMBUS, OHIO

MR. COLLIER: Mr. Chairman and Conferees:

The United States Geological Survey, Department of the Interior, welcomes the opportunity to present a summary of its investigations of the water resources of Lake Erie and its tributaries. Since its creation more than a century ago, the Department of the Interior, through its agencies, has been primarily devoted to the exploration, development, management, utilization, and conservation of the Nation's natural resources. In performing these duties, the Department of the Interior and the Geological Survey have set as their goals, maximum benefit to the public and continued contribution to the economic growth of the Nation.

Our society today places an ever-increasing demand on the Nation's water resources. Misfortunes such as devastating floods, severe droughts, and dwindling water supplies have always been of vital interest to the public, and much has been done to control or alleviate them. Never before, however, have the demands for water been so great. The water requirements for domestic, industrial, and recreational uses, and for waste disposal, have all increased sharply in the past decade, and continue to increase year by year.

In order to meet this increasing demand for water, it is essential that the total supply provided by Nature be conserved, developed, and managed to provide for its fullest and most efficient use. The agencies which have this responsibility must therefore continually increase their fundamental knowledge of our water supply and the natural and cultural factors which control its quantity, quality, and movement.

The U. S. Geological Survey, in its systematic appraisal of the Nation's natural resources, has for many years provided data basic to the development and management of these resources. Among the products of the Survey which contribute to the scientific knowledge of water and its environment are geologic maps, topographic maps, and published reports providing hydrologic information and interpretation.

Geologic maps not only provide valuable information to the construction engineer and mining industry, but they also aid in the understanding of ground water, its location, quantity, quality, and movement.

Topographic quadrangle maps, the basic maps of the land surface of the United States, provide to the water-resources specialists a wealth of information concerning the physical features of streams and their drainage basins. These maps are the source of information on the size, shape, slope, and drainage network of the basins; location of water diversions and waste-water outfalls, as well as land surface elevations and cultural features. They are used extensively as a base for geologic and flood-inundation mapping.

Recent topographic maps are available for all of the land surface drained by streams tributary to western Lake Erie in the States of Michigan, Indiana, and Ohio. In 1962 the Geological Survey, in cooperation with the State of Ohio, completed a 3-year program of complete remapping of the State by aerial photogrammetry. The resulting maps were published as 7-1/2 minute quadrangles at a scale of 1 to 24,000. These maps are revised periodically so that they remain up-to-date and reflect recent changes in drainage and land use due to urbanization, highway relocations, shore erosion, etc.

Let us look at the hydrologic information - the basic water facts - and the interpretation of those facts, which the U. S. Geological Survey provides. The work focused toward the description and understanding of water in its environment and the continuous appraisal of the water resources of the Nation. Through close cooperation between the State and local agencies and the Geological Survey, emphasis is placed where water problems are most urgent. These hydrologic investigations include the determination of quantity, chemical and physical quality, distribution, movement, and uses of both surface water and ground water.

The collection of water facts on streams tributary to western Lake Erie was begun by the Geological Survey in 1898 with the establishment of stream-gaging stations on the Maumee River at Waterville, Ohio, and on the Sandusky River at Mexico, Ohio, and near Fremont, Ohio. Since this early beginning, a network of stream-gaging stations has been established which includes all the major rivers and many of the smaller streams draining into Lake Erie. Water-quality records are being obtained at many of these stations. The networks of streamflow and water-quality stations are financed under cooperative programs with the States of Michigan, Indiana, and Ohio, by the Corps of Engineers, and by Federal Geological Survey funds.

In Michigan, continuous streamflow data have been obtained at 14 sites in the Huron River and River Raisin basins. In addition, 6 partial record stations are operated in those basins to obtain hydologic data during periods of low streamflow when water-quality conditions are most critical.

Daily streamflow records have been obtained at 11 stations in the Indiana portion of the Maumee River basin. Since 1954, the daily sediment discharge of the St. Marys River has been measured by the Indiana Flood Control and Water Resources Commission. In 1963, as part of a cooperative program with the Geological Survey, this station was included in a statewide Indiana network, and two additional sediment stations were added in the Maumee River basin.

In the early 1920's, the State of Ohio and the Geological Survey expanded the stream-gaging network in Ohio to include the major tributaries entering Lake Erie. The network has continued since that time, and today it includes 32 continuous recording stations and 29 stations for low-flow or flood-crest information.

In 1946, the cooperative program with Ohio was expanded to include the measurement of water quality. In the Lake Erie basin, facts on chemical and physical quality of water are now available for 44 stations, water temperature data for 28 stations, and sediment discharges for 4 stations. In addition, occasional samples have been collected for chemical analyses at a great many other sites in the area.

Chemical water-quality measurements are designed to measure the contribution of dissolved mineral matter by the rocks and soil through which the water flows on its path to the Lake, as well as the dissolved material added to the water by domestic and industrial wastes. Measurement of the physical characteristics of the water - such as specific conductance, temperature, color, and sediment content - is an integral part of the hydrologic studies.

Data obtained at the chemical-quality stations vary both in the frequency of sampling and in the completeness of the analysis. Sampling schedules - set according to need - may be daily, weekly, monthly, or seasonal. Some stations are operated throughout the year and some only during periods of low flow when, due to the shortage of dilution water, pollution problems become more critical.

At some stations, continuously recording instruments may be required to define the water quality. The recording monitors provide a continuous record of the specific conductance, pH, dissolved oxygen, and water temperature of a river. These records, supplemented by daily sampling for more complete analysis, provide an excellent measure of the water quality of the stream, particularly of those streams which receive municipal and industrial waste loades that cause rapid fluctuations in the water quality.

As part of the Geological Survey's cooperative programs with the Ohio Department of Health and the Ohio Department of Natural Resources, recording monitors are now operating on the Maumee River at Waterville, on the Cuyahoga River at Independence, and on the Cuyahoga River here at Cleveland. Additional monitors are scheduled for installation near the mouths of the other major tributaries to Lake Erie and on the principal rivers and tributaries inland from the Lake.

Water quality of a stream is greatly influenced by the quantity of streamflow. The water managers are therefore regular users of these water facts in assessing stream conditions. The data are basic to the design and evaluation of water development, control, and pollution abatement programs. They are particularly valuable when they extend over a long term, so that a wide variety of hydrologic events are included in the records.

The Geological Survey publishes the records of basic data annually so that they are available to all governmental agencies, to industry, and to the public. For the records of surface-water discharge, a series of publications has been established for each State entitled, "Surface Water Records of Ohio, or Michigan, or Indiana," and each report contains the day by day discharge at each station for a complete water year. At 5-year intervals, these records are summarized and the compilations published in the Water-Supply Paper series.

The records of water quality, including chemical analyses, water temperature, and suspended sediment, have in the past been published annually in the Water Supply Paper series by river basins. Beginning with the 1964 water year, these records will be available for each State similar to the streamflow records, with compilation reports in the Water Supply Paper series.

Fluctuation in ground-water levels recorded in wells comprising the observation well network is included in the Water Supply Papers. This network of wells is used to determine the changes and trends in ground-water levels of the principal aquifers. The Ohio network includes 30 wells located in the Lake Erie drainage basin.

To further the knowledge and understanding of our water resources and man's effect on it, these basic water facts are used as a foundation for interpretive studies and investigations. The water resources of Lake Erie and its tributaries are the subject of or are included in many of these reports. I will mention only a few.

In the 1950-1952 Lake Erie Pollution Survey, the U. S. Geological Survey cooperative program with Ohio was expanded to provide the necessary streamflow data and analyses, and to define and interpret the chemical and physical quality of the principal rivers in Ohio emptying into Lake Erie. This survey provided a comprehensive study of the hydrology and existing water-quality conditions of the area.

Report No. 14 of the Ohio Water Plan Inventory, Quality of Surface Water in Ohio, provides a review of the chemical and physical characteristics of Ohio's streams, including those draining into Lake Erie.

Bulletin 37 of the Ohio Department of Natural Resources, "Low-flow frequencies and storage requirements for selected Ohio streams," includes the major tributaries to Lake Erie and will be invaluable in the design of water-management and pollution-abatement programs. Reports available on the flow duration, flood frequencies, and major floods of these streams will aid in this work.

A study of the hydrologic system and the interrelationship of ground water, surface water, and water quality of the Maumee River basin has been completed and will be published as a Hydrologic Atlas. Investigations are underway or completed on the geology and ground-water resources of Portage County, Geauga County, and on the principal aquifers of 14 counties in northeastern Ohio.

From these studies and active "water-fact" programs, a wealth of information is provided on the fundamentals of the water resources of the Lake Erie basin. The abatement of pollution and the maintenance of water quality must be based on a clear understanding of the hydrology and fundamental water facts. Development and management must be from the standpoint of water as a resource.

Mr. Wampler will continue with the Interior presentation.

Thank you very much.

I wonder, do you want to withhold questions until the whole presentation is through?

MR. STEIN: I think that might be better. Just hold yourself available.

Mr. Wampler.

CONTINUED STATEMENT OF MR. FRED WAMPLER

MR. WAMPLER: Thank you.

Mr. Chairman, I will make a presentation for the next three bureaus within the Department of the Interior. The first is the Bureau of Sport Fisheries and Wildlife.

Man, in becoming settled to communal living has so unsettled natural conditions that few water users

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obtain water in its original quality. Landscapes have been scalped, pastures cultivated, forests burned, and waters polluted -- all this in man's quest for living space and a better standard of living.

Much of the economy and recreation benefits of the Lake Erie Basin are directly attributable to the Lake proper. Water from the Lake is indispensable for the continued growth and survival of the Lake Erie Region.

While the needs for water are increasing at a tremendous rate, the supply of water remains fairly constant. The task of providing clean water in the face of an ever-increasing need is made more difficult by the increased demands for recreational water supplies. More people are enjoying additional leisure and clean water is essential to recreational pursuits.

Concurrent with these human needs are the requirements of fish and wildlife. These resources need water of satisfactory quality to provide for their feeding, reproduction and growth.

Pollution problems in the Lake Erie Basin have increased to the point where there is a real threat to many forms of aquatic life. Natural habitats of Lake and stream dwelling animals have been seriously depleted -- some to the point of irreparable damage. The impact of

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gross deterioration of water quality upon aquatic life has been startling. Early surveys of water quality of Lake Erie serve to document the decrease in desirable fish species and aquatic insects which has come about as a result of polluted water and environmental conditions.

Comprehensive surveys made by the cooperating Lake Erie states, have revealed that pollution from tributary streams has significantly reduced aquatic resources. Bottom muds, once the environment for desirable insects, have been so degraded that only pollution-tollerant organisms now survive. Fish habitats have in some areas become so degraded that they are almost devoid of desirable species. Many tributaries, once used as spawning areas by muskellunge, bass, trout, and sturgeon, are now unusable for this purpose. Fishing near the mouths of polluted tributaries has similarly decreased.

Many Lake Erie tributary streams were badly polluted during the transition of agriculture to industry to the early 1900's. Some became devoid of fish following pollution. Draining of marshes and other wet areas destroyed valuable habitat for some important food and forage fishes. Industrial plants pouring effluents into streams included steel mills, slaughter-houses, dairies, breweries, and food processing plants.

The sport fishery of the Lake Erie Basin provides almost unlimited fishing opportunities. Preferred sport fishes include trout, bass, walleyes, northern pike, muskellunge, and various panfishes. If desired species of fish are to survive throughout this basin, it is evident that expanded facilities for pollution control must be designed and regulations -- once put into effect -- rigidly enforced.

The lower Detroit River, Western Lake Erie and the Upper Niagara River have traditionally supported wildlife populations of National significance. Of primary importance are the large numbers of migratory waterfowl which congregate in these areas during periods of migration and during the winter months.

Fur animals, including muskrats and mink have, throughout the years, made a substantial contribution to the economy of Western Lake Erie. Annual fur harvests are valued in excess of one million dollars.

To these birds and mammals, Lake Erie must provide much more than a safe water supply for drinking. Wildlife requirements resemble those of fish, inasmuch as the aquatic environments must afford a

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stable and readily available food supply, shelter, and a place for reproducing and rearing of the young.

For the most part, water-oriented forms of wildlife are adaptable to the environmental changes wrought by man. Over the years, man's activities have warmed some of these waters to the point where they remain ice-free. Large numbers of migrating waterfowl now use these areas throughout the winter. In some instances moderate enrichment resulting from sewage has brought about increased production of the aquatic plants and animals which provide food for wildlife. Pollution forces the wildlife to either adjust to the new conditions or disappear from these areas. Too often it disappears. On several occasions, the lower Detroit and portions of Western Lake Erie's great marshes have functioned as death traps for great numbers of waterfowl. Smaller, but regular losses have also occurred in and around major harbors of the Lake and in the Niagara River. In several areas, large beds of aquatic plants have been eliminated. Lake bottoms are covered with the shells of small snails and clams, yet few living mollusks can be found! Waterfowl food supplies are rapidly disappearing.

In many cases Lake Erie's wildlife problems can be traced to pollution from industrial sources. Domestic pollution continues to be a problem in some areas.

Water pollution cannot be controlled by isolated efforts. United actions will be necessary to check or control this evil. The task is so formidable that only a monumental and combined effort of public agencies at the State, Federal and municipal level -- working closely with industry -- can be expected to succeed. Delay can only result in bigger problems, so let's go to work.

MR. STEIN: Thank you.

MR. WAMPLER: The next is for the Bureau of Mines.

Should I continue, sir?

MR. STEIN: Yes. Go right ahead.

MR. WAMPLER: Thank you.

For the Bureau of Mines:

Many of the water problems which concern us today must be approached comprehensively in order to progress toward an effective solution.

The Bureau of Mines is concerned with water as a commodity, and also because of its utility in producing, processing, and shipping minerals. Over a period

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of years the Bureau has accumulated experience, facilities, and qualified personnel whose knowledge of chemistry, geology, metallurgy, engineering, and even bacteriology permits attack on the diversity of problems. We are particularly concerned with the effect of water quality on the development and use of mineral resources, with the nature of aqueous effluents from mineral industry operations, and with the continued use of cheap water transportation of bulk mineral materials.

In common with other agencies, the Bureau of Mines has interests and responsibilities in the economic and social aspects of water quality management. Quantity requirements and competitive uses must be given consideration in programs for multiple-purpose water development projects. The Bureau takes particular account of the economic and other effects that protection of water quality and pollution abatement will have on the community.

In 1963 the value of U. S. mineral production from the area draining directly into Lake Erie was about $175 million; this represented principally raw materials for the construction, chemical, and ceramic industries. Since such activities play vital parts in both the regional and the national economy, it is obvious that growing demands for minerals must continue to be met. Output of these mineral products requires process water, and usually will generate waste effluents.

Stream pollution from process wastes now is generally recognized to be a serious problem. Enlightened management in the mineral industries recognizes the need for meeting responsibilities to the public. Within the limits of available technology and economics, it is developing methods for minimizing its waste discharges. However, pollution abatement programs take time to become effective and sometimes industry, understandably, does not welcome controls for which current technology affords no economically practical means of compliance.

A significantly large part of the Nation's iron ore is smelted along the shores of Lake Erie, and in furnaces as far from the Lake as Pittsburgh, Youngstown, Warren, Canton, Massillon, and Steubenville. Maintenance of water levels in the Great Lakes which will permit operation of deep-draft vessels is vital to the continued cheap transport of iron ore, limestone, and coal for a healthy steel industry.

The Bureau, thus, is concerned both quantitatively and qualitatively with the waters of Lake

Erie itself. It welcomes opportunities to assist and cooperate with other organizations that have similar interests.

Mr. Chairman, next is the Bureau of Outdoor Recreation.

The Bureau of Outdoor Recreation was established by act of Congress on May 28, 1963, as a result of recommendations made by the Outdoor Recreation Resources Review Commission, to provide a focal point in the Government for the Nation's outdoor recreation activities. The Congress took this action because they deemed it desirable that (1) all American people of present and future generations be assured adequate outdoor recreation resources, and (2) that prompt and coordinated efforts be made toward conserving, developing and utilizing such resources for the benefit and enjoyment of the American people. Thus, it has become the purpose of this bureau to fulfill these desires of the Congress. As a result, this bureau shares a very deep concern for events which have been and are taking place in the area under consideration here, events which have affected the natural resources of this region and their usefulness to the American people for recreational pursuits.

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This bureau is presently engaged in a study of water-oriented outdoor recreation in the Lake Erie Basin including the St. Clair and Niagara Rivers and intervening waters. The study area coincides very closely with the area of concern to this conference.

This study area had a 1960 population of nearly 10 million people. It is among the most highly urbanized and industrialized in the nation. Population projections indicate the population will more than double in the next fifty years. Water-oriented recreational resources on the other hand are now inadequate, particularly in the large metropolitan areas, and very likely will remain at present levels unless developed artificially at great expense. Contributing to the present inadequacy, is the fact that the waters of Lake Erie and many of its tributaries are polluted to the extent that they are unsuited to certain water-oriented recreation activities especially in the vicinity of the highly urbanized areas.

It has been established through studies by the Outdoor Recreation Resources Review Commission that our greatest need is for outdoor recreational areas near population centers. The ORRRC studies further indicate 90 per cent of all Americans participate annually

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in some type of outdoor recreation with 44 per cent preferring water-oriented recreation, mainly swimming.

Most of the 10 million inhabitants of this area are within the day-use zone of Lake Erie, among the largest bodies of fresh water in the world. The Lake is a real treasure for many as a place to enjoy outdoor recreational activities. However, the pleasure of swimming in its cooling waters or sunbathing along one of its pleasant beaches is diminished to varying degrees due to deterioration of water quality. For example, the beach at Sterling State Park near Monroe, Michigan, has been posted as unsafe for swimming since 1961. During this period annual attendance has dropped from over a million to less than 320,000 in 1964. Other areas hard hit by pollution include the shore east of Toledo, near Loraine and Cleveland, Ohio; Silver Creek, Dunkirk and Buffalo, New York. One of the beaches of Presque Isle State Park, in Pennsylvania, has also experienced pollution problems which, as a recent study indicates, are becoming progressively worse. The pollution of portions of Lake Erie and its tributaries has also affected other forms of recreation. The recent failure of boat livery businesses near Buffalo, New York was attributed to pollution of adjacent waters. Thus, pollution prevents full use of one of the most important recreational assets of this region in the very locations where recreational development is needed most.

Indications are that if the present trend continues, millions of people within this area will be left without a place to swim. In addition, boating and other recreational activities utilizing the lake for esthetic purposes will surely be curtailed if action is not initiated at an early date.

The Bureau is pleased that such action is being considered by the U. S. Public Health Service and other interested agencies who recognize the problems involved in the matter of pollution of Lake Erie and its tributaries. We pledge our cooperation and assistance to the States and to the Public Health Service in actions designed to meet these problems and make the public beaches and waters safe again for water-oriented recreational pursuits by the local citizens and other visitors to the area.

Since the Bureau of Commercial Fisheries has been actively participating with the Public Health Service on the Great Lakes-Illinois River Basin Project, and has shown a very great concern and effort in their studies, analyses, decisions, and active participation, we felt it was most fitting that we take the introductory remarks that I have here, Mr. Chairman, and have them entered into the record, and I will then call on Mr. Ernest Premetz, Associate Director for Commercial Fisheries at Ann Arbor, who will present a statement.

MR. STEIN: Without objection, that will be done.

MR. WAMPLER: Thank you. The following are the introductory remarks by the Bureau of Commercial Fisheries:

The Bureau of Commercial Fisheries has been actively participating in the Public Health Service's Great Lakes-Illinois River Basin Project, which includes Lake Erie. In fact, scientists of the Bureau of Commercial Fisheries are closely coordinating their research activities with those of the Public Health Service to assure that pollution abatement measures reflect full cognizance of fishery problems. The aim is to prevent further deterioration and, to the extent possible, mitigate damage to fish and aquatic life. In the early stages of the Public Health Service study, the Bureau of Commercial Fisheries was pleased to make available vessels and technical know-how of its personnel. Many of the Public Health Service scientists concerned with

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this tudy were afforded an opportunity to work intimately with, and receive guidance from, the Bureau's experts, whose extensive experience with Great Lakes fisheries and the effects of pollution on fish and aquatic life have been long recognized.

Interest in and authority for participation by fisheries interests in such coordinated studies originates in a Congressional Act of March 3, 1887 (16 U.S.C. 744), which authorized the Commissioner, United States Fish Commission, to prosecute investigations and inquiries concerning the supply of food fishes of the coasts and lakes of the United States and the determination of protective, prohibitory, or precautionary measures to be adopted. Subsequent legislation, particularly the Fish and Wildlife Act of 1956, as amended, and the Fish and Wildlife Coordination Act of 1958, as amended, refined and strengthened these responsibilities.

Section 5 of the Fish and Wildlife Coordination Act authorizes the Secretary of the Interior, through the Fish and Wildlife Service (the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries) and the Bureau of Mines, to make such investigations as he deems necessary to determine the effects of domestic sewage, mine, petroleum, and industrial wastes, erosion silt, and other polluting substances in wildlife and to make reports to the Congress concerning such investigations and of recommendations for alleviating dangerous and undesirable effects of such pollution.

Pollution has many definitions depending on the interests of the individual. If water for human consumption is the main interest, then with adequate treatment, perhaps the waters of the Lake Erie drainage are of good quality. However, some water intakes have been abandoned and others have been extended out into the lakes because of water quality problems. A measure of pollution is the suitability of water for a required use. Consequently, pollution can be defined as the addition of any substance or any action or condition which interferes with, lessens, or destroys a beneficial use of a water. The Bureau of Commercial Fisheries is presently concerned with the suitability of the waters of the Lake Erie drainage for fish and fish food organisms.

The Fish and Wildlife Act of 1956 recognizes that fish and shellfish are capable of making a great and continuous contribution to the national economy, food supply and health, recreation, and well-being of our citizens. When these resources are property protected, properly developed, properly managed, and properly utilized, the Act considers them capable of being greatly increased. Control of pollution is one conservation measure that must be practiced. The alternative is destruction by neglect.

It is the National Fisheries Policy to:

1. Increase and maintain forever, for the people of the United States, a fishery resource capable of yielding the maximum annual product.
2. Strengthen and maintain a vigorous fishery industry by assuring full and fair access to the American market.
3. Do these things in partnership with the States and in full accordance without international obligations and without sacrificing the system of free enterprise.

In pursuing these policies, the Federal Government has a responsibility to the public as a whole to see that our fishery resources are utilized to the fullest economic extent without damage to their future productivity.

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There are few greater challenges to this mission than Lake Erie, whose fisheries are currently in acute distress. In many areas, commercial fishing has all but disappeared and sport fishing becomes progressively less attractive. The loss of Lake Erie's fish production capacity is coming when there is a rapidly increasing need for food protein in this country; for that matter, throughout the world. Compared to the thousands of commercial fishermen who were able to make their livelihood fishing Lake Erie only a few years ago, now only a small percentage are still in business. Many of these men fish on a part-time basis. During the past decade alone, the total catch from U. S. waters has declined 45 per cent and the dollar return, 60 per cent.

The fishing industry of Lake Erie has lost much of the production of high-priced species. It must subsist largely on such medium-priced varieties as yellow perch and white bass, and on such low-priced, often unmarketable, fish as sheepshead and carp. Other vast quantities of fish, e.g., gizzard shad, are also present for which markets do not exist and are, therefore, not harvested at all.

These shifts in species composition have been long term and their causative factors are very complicated. The evidence is strong, however, that the primary causative factors stem from environmental changes. The major change has been the progressive and growing enrichment of the Lake. Man's activities along Lake Erie and its tributaries are telescoping the time scale and pushing Lake Erie into premature senility. All lakes age naturally, but we have packed into a decade what it would take nature centuries to accomplish. Fertility in modest measure is useful, but man is making Lake Erie so fertile so fast that conditions are rapidly approaching the intolerable.

The concentrations of calcium, sodium, potassium, sulphates, and chlorides, for which research records are available over a sufficient long period to show trends, have exhibited build-ups -- 230 per cent in the case of chlorides. Other substances in sewage and drainage from chemically treated uplands are probably also accelerating their build-up, but the lack of long-term data makes this difficult to demonstrate. Largely unknown are the effects on lake temperature of the 3 billion gallons of water used for cooling condensers in power-generating plants.

What is known is thatas many as 4,000 square miles of bottom water in Lake Erie become utterly devoid, or reach levels below which fish can live, of oxygen that is so essential to life. In addition to affecting fish spawning and survival, it has completely changed the formerly abundant insect population upon which the fish relied for food. Although these desirable insect food organisms have been replaced by other forms that can tolerate low or no oxygen, they may not be as nutritious or are not available to the fish.

The greatest changes in fish populations have occurred during the past 10 to 15 years. These changes have occurred during the period of greatly increased use of detergents and pesticides. Consequently, increased fertility may not be the only factor involved in changes in the Lake. The present adverse state of affairs in Lake Erie represents only a stage in a process that has been underway for many years and which now seems certain to advance at an accelerated rate as human population and industrial activities expand. Although immediate conventional abatement of the worst pollution situations will be helpful, much still remains to be done if we are to prevent future deterioration of fish and aquatic life resources, let alone mitigate past damages. For this reason, the Bureau of Commercial

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Fisheries intends to continue its close working relationship with the Public Health Service. The Great Lakes pollution problems will continue to receive priority attention in the research programs of the Bureau of Commercial Fisheries.

Because of the direct application of Bureau of Commercial Fisheries research on Lake Erie to the subject matter of this conference, Mr. Ernest D. Premetz, Deputy Regional Director of the Bureau's Great Lakes and Central Region, will present an additional statement. This statement will go into the technical aspects in greater detail and outline the Bureau's involvement with the Public Health Service study.

Thank you, Mr. Chairman.

STATEMENT OF MR. ERNEST D. PREMETZ, DEPUTY REGIONAL DIRECTOR, BUREAU OF COMMERCIAL FISHERIES, U. S. DEPARTMENT OF THE INTERIOR, ANN ARBOR, MICHIGAN

MR. PREMETZ: Mr. Chairman, Conferees, ladies and gentlemen:

For the record, I am Ernest Premetz, Deputy Regional Director for the Bureau of Commercial Fisheries, at Ann Arbor, Michigan. We cover 18 states in the Great Lakes and central area, so we have a lot of water problems to worry about.

As Mr. Wampler mentioned, the Bureau of Commercial Fisheries has been actively participating with the Public Health Service in its Great Lakes-Illinois River Basin Project. In fact, we just recently completed a comprehensive study of Lake Michigan, and a report has been prepared which has been turned over to the Public Health Service for inclusion with their comprehensive report.

We are now in the process of completing a similar study in Lake Erie, and the report will be available this fall. This will cover the data we have accumulated over a period of some 50 years and, in some cases, our records go back before the turn of the century, so that we do have a vast amount of data.

Evidence is accumulating that pollution may be a major factor in limiting the production of fish in fresh and estuarine waters, and pesticide pollution may even be influencing fish populations in the open ocean. Consequently, the Bureau of Commercial Fisheries has reason to be concerned about pollution and has, in fact, been directed by Congress to work for its prevention and control.

Pollution has many definitions depending on the interests of the specific individual or group. Almost everyone will agree that pollution means the addition of something -- whether trash, chemicals, biological entities, or even heat -- which reduces the quality of an environment for specific purposes. A widely accepted measure of pollution is the suitability of water for a required use. Therefore, we cannot consider a single set of water quality standards as being applicable for all uses. Water suitable for industrial use may not be acceptable for human consumption and even less acceptable for fish and wildlife. In dealing with the suitability of water for fish we are not concerned merely with the question of whether fish can survive in the water; we must consider whether the entire environment is suitable for satisfactory reproduction and growth of fish.

I am deeply indebted to Dr. Tarzwell for the excellent job he did yesterday in giving all of you a short course on pollution and on eutrophication. These are terms we hear often.

The Bureau of Commercial Fisheries is very concerned about Lake Erie as a suitable environment for fish, since there have been dramatic decreases in the abundance of several important commercial species.

I hate to use the terms "commercial" and "sport," because we try to study fish generally. We talk about fishes, rather than sport and commercial fish.

Gone from Lake Erie are the keystones that supported a healthy and lucrative sport and commercial fishing industry -- second to none in the years 1935 - 1958. Blue pike, walleys, whitefish, and yellow perch stocks have dwindled to insignificance or have changed character so much that their contributions to the welfare of the fishing industry are almost nil. For example,

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following the initial collapse of the blue pike and walleye production in 1958, fisheries for both species continued to decline to insignificant levels. Blue pike production dropped from 6,855,000 pounds worth $1,316,000 in 1956 to 200 pounds worth $120 in 1963.

I don't have later figures with me, but from what I have been able to gather, the blue pike is now a biological rarity in Lake Erie.

Walleyes contributed 5,035,000 pounds worth $1,357,000 to the catch in 1957 and only 433,200 pounds worth $186,000 in 1962. In less than eight years the fishing industry in U. S. waters of Lake Erie lost dock-side value in these two species alone of 2.5 million dollars annually.

At the same time, in Ohio alone, 750 jobs have been lost in the fishing industry in the last five or six years, so we can see that the contribution to the economy of the area has declined somewhat as a result of these problems.

Other usable fishes in Lake Erie are threatened to the extent that stability and development of stocks are extremely undependable and beyond predictions. We are at a loss to be able to predict anything.

From evidence available it appears that

walleye and blue pike populations collapsed as the result of a series of poor year-class survivals. Among the walleyes, estimates of year-class contributions to the fisheries indicate weak year classes in 1945, 1957, and 1958, and moderately weak year classes in 1953, 1955, 1956, and 1959. If the large catches of walleyes during 1953-1959, which consisted of large and older fishes (2-8 years of age), are any indication of the size of the spawning populations, then certainly the reason for lack of survival of the young was not because of a dearth of eggs. The adult population of walleyes, except for 1958-59, was as large or larger than previous populations that were capable of increasing the size of the walleye stocks. Something in the environment was limiting the survival from eggs to juvenile walleyes. Just what this something was cannot be named with certainty. But, studies of the environment, particularly the bottom conditions of the Lake, were showing drastic changes in chemistry and biota, either of which could have been responsible. These fish are closely associated with the bottom sometime during their life. They have eggs that settle to and hatch on the bottom and bottom organisms are an important part of their diet. Consequently, any significant changes in the

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sediments can affect these fish. All data collected to date indicate that changes have occurred. A significant change in dissolved oxygen in the bottom waters of the western basin of Lake Erie was discovered by Ohio State University in September of 1953. In less than 5 days, the dissolved oxygen levels reached 0.7 - 1.2 ppm in many areas. Unfortunately, observations were not made in the central basin of the Lake so that the true extent of this phenomenon cannot be circumscribed.

However, studies made in the central basin as early as 1929 showed oxygen deficiencies below 65 per cent (some stations below 40 per cent) saturation in some areas during July and August. It is not unreasonable to assume that serious oxygen deficiencies in the central basin occurred regularly and even more frequently than in the western basin. Two phenomena always accompany periods of oxygen deficiency in Lake Erie. Thermal stratification is established and the zone of oxygen deficiency is always near the bottom; so much so that special samplers have had to be devised to demonstrate the vertical extent of the affected column of water. Frequently, the thermocline and oxygen deficient layers are less than 2 meters thick.

Since 1953, extensive oxygen deficiencies in the middle and frequently the western basins of Lake Erie have occurred affecting thousands of square miles. This condition has been detected every year since 1958 and it appears that its regularity of occurrence is becoming accepted as a seasonal phenomenon.

Along with these evidences of oxygen deficiency other characteristics of the chemistry of Lake Erie have been changing. In summary, here are the trends among some of the major constituents:

Item	1907	1961
Calcium	31.0 ppm	38.3 ppm
Sodium and potassium	6.5	11.0
Silica	5.9	1.6
Sulfates	13.0	24.0
Chlorides	7.0	23.4
Total solids	133.0	183.0

Data on nitrogen and phosphorus are not directly comparable among years of observation. However, from the various sources one can conclude that both nutrients in all their general forms increased during the past 50 years.

The situation in Lake Erie is difficult to

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deal with employing the usual surveys, techniques, and criteria for detecting and measuring pollution, since much of our knowledge concerning pollution has been developed from work on rivers, streams, and small bodies of water. We have relatively little knowledge of the effects of pollution on large lakes. Nevertheless, ample evidence exists to demonstrate that Lake Erie has changed appreciably during the past 50 years.

As Dr. Tarzwell explained, lakes are essentially transitory things on the geological time scale, and as they age they change. The aging process of a lake is usually so slow and subtle that it frequently goes unnoticed in a lifetime of man. In fact, it has been unnoticed really until the last 10 or 15 years in Lake Erie, but it has been going on for a long, long time.

When lakes are used for the disposal of industrial and human wastes, the aging process may be greatly accelerated as has been thoroughly documented in Lake Zurich in Switzerland and Lake Washington near Seattle over the past 50 years. Never before, however, has such a dramatic process of accelerated aging or eutrophication been detected in a lake the size of Lake Erie.

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Except for the oxygen deficiencies, one might say that limnological changes have not been highly critical. However, to make the consideration more comprehensive, we must add at least two additional factors that are definitive where fisheries are concerned.

In the last 45 years, mean annual water temperatures have risen almost 2° Fahrenheit. The sedimentation rate has increased markedly and these sediments have become more active and complex chemically with the passage of time. Preliminary experiments with the sediments demonstrate a very high oxygen demand. A small amount of sediment (5 gm) can remove almost all the dissolved oxygen in a 250 ml water sample in less than 5 minutes.

This explains why at certain times of the year in Lake Erie we have as much as 4,000 square miles of bottom water which is entirely devoid of oxygen.

The relationship of fisheries and pollution, then, in Lake Erie can be traced primarily to the spectacular oxygen depletion that results whenever these sediments and the bottom waters become isolated by thermal stratification from the usually active circulation of the Lake's entire water mass. Since 1953, this phenomenon has reduced the abundance of mayfly larvae (Hexagenia) from 400 to 10 individuals per square meter, and in places, entirely eliminated them; increased sludge worms (oligochaetes) many fold; reduced caddisfly larvae almost to the vanishing point; favored large increases in the populations of low oxygen tolerant forms of midges; reduced the nontolerant midge forms; caused an increase in some fingernail clams; and generally reduced the numbers of all bottom organisms.

The original community of organisms was an essential part of the food chain which contributed vital components to the survival and normal growth of the various species of fish that were desirable in the fishery. Changes in this community have reduced markedly the success of the normal fish populations and, in turn, the economics of the fishing industry. To the Bureau of Commercial Fisheries, this rather narrow stratum in the bottom of Lake Erie, with its associated low dissolved oxygen content, is polluted to the extent that the status of the entire Lake as a useful producer of fishery products is uncertain.

In view of the Bureau's responsibility, this condition is as vital and as in need of correction as any undesirable feature of the Lake that impinges directly on the public health or safety. We will not have completed our job until the conditions that militate against fisheries have been corrected. The Bureau intends to continue its studies of and its interest in the improvement of this Lake and its drainage basin.

I have completed the formal part of the report, but I do want to add one thing.

I hope the people who are sitting here are not looking for a miracle, and that they don't get the impression that by holding hearings such as this and getting a start on some of these things, we have found the Fountain of Youth for Lake Erie.

Things have changed. We have a serious situation in Lake Erie. Things are going to continue to change. We are not going to bring back the good old days, regardless of what we do.

We can, however, take these first steps that are being recommended here to prevent further deterioration, and, believe me, there is going to be further deterioration unless we do something about it.

At the same time, I hope we don't become complacent when we take the steps that are recommended here and feel that the job has been done. It has not been done. There is considerable research still to be done and it is going to take a long time, and this research should be underway now and should be started as soon as possible.

There is a lot we don't know, and there is a lot we have got to learn if we are going to save our lakes. It may be too late to save some of them, but there are still others that are on their way out unless we do something about it.

At the present time, our scientists feel that conditions have not deteriorated as greatly in the eastern end of Lake Erie as they have in the western end, but their estimate is that within 15 years the eastern end of Lake Erie is going to be just as bad as the western end. In fact, they feel that there is about a 15 year difference between the two areas, simply because of the different character of the two areas. We have deeper waters in the eastern end.

Another thing: I do urge that we consider not only what enters the lake from the industries along our shore, but what enters the Lake from the various sewage treatment plants.

These all contribute, yes, to some extent, but we have one other factor. All of these things have washed off our lands. We have a great agricultural industry throughout the Great Lakes area. They use all forms of pesticides on the land, and things of that sort. This is washing off into our water. This is settling in our lakes. This is in the bottom sediments which are highly active. This is affecting our fish populations.

This is not something that we have to worry about as far as human population at the moment, and I hope we never do, but it is affecting the fish population and particularly their ability to reproduce. Various species, of course, are affected differently by these things.

So, these are all things that I hope we consider. I hope we don't stop after we take some actions at these particular conferences. I hope we continue to give this problem the serious and continuing attention it deserves.

Thank you.

MR. STEIN: Thank you.

Mr. Wampler?

MR. MORR: Mr. Stein, could I ask a question?

MR. STEIN: Yes, but I think we said that we would allow the completion of the presentation. I know there are several questions.

MR. MORR: All right. Thank you.

CONTINUED STATEMENT OF
MR. FRED WAMPLER

MR. WAMPLER: In order, Mr. Chairman, to bring this presentation to a conclusion, I wish to state that I think that we will gladly entertain any questions from the panel here, especially those that can be fielded by Mr. Collier and Mr. Premetz in the scope of their areas, and those that are dealing with the other bureaus where a presentation was made, we will ask the recorder to send the particular question to the bureau, and we will come up with the information.

MR. STEIN: Thank you very much, Mr. Wampler, for an excellent and comprehensive presentation.

I for one have welcomed the Department of the Interior's interest in water quality on a nationwide basis. I was particularly interested in Mr.Premetz's notion that we shouldn't just confine ourselves to waste coming from cities and industries, but that we have to take into account runoff from agriculture.

We welcome your participation in the 17 western states too. We think Mr. Premetz has made a very good statement on all three aspects, industries, municipalities, and agriculture, and we hope that your Bureau of Reclamation out there might agree with that and cooperate with us too.

MR. WAMPLER: Thank you.

MR. STEIN: Mr. Morr, did you have a question?

MR. MORR: I have a question of Mr. Premetz, if I may.

Just to make this as clear as we might, is it then the conclusion of your bureau -- I'm sorry I don't have a copy of your statement, or I might not have felt it necessary to ask this question -- but is it the conclusion of your bureau that the primary causative factor for the decrease in walleyes and blue pike in Lake Erie would be pollution or siltation?

I didn't get this clearly, the primary causative factor.

MR. PREMETZ: Actually, the only thing we can do is to relate what has happened in the environment to what has happened to fish.

The environment has been changed by various things we have added to the water. Therefore, I would say yes, on the basis of this established relationship.

It is very, very difficult to try to perform an autopsy on a fish, or to actually be able to state with certainty that a particular fish has declined completely because of one or two or three different factors or different things that might be introduced into the water.

MR. MORR: What about a biological change?

MR. PREMETZ: Yes, we have natural changes too.

I mentioned the increases in water temperature of two degrees. This has affected certain species, but not those that we are concerned with right at the moment. This is probably the causative factor of the decline of the Cisco fish, which, as earlier papers showed, was not due to and earlier scientists felt was not due to pollution.

MR. MORR: But we are establishing today that a primary causative factor is pollution?

MR. PREMETZ: Yes.

MR. MORR: And possibly siltation, speaking about an entire change of events or a biological change within the environment?

MR. PREMETZ: Right.

MR. MORR: Is there also then a cyclical occurrence that has an apparent effect on the decline of walleyes in Lake Erie, a cycle situation?

MR. PREMETZ: Well, you have increases and decreases in abundance of particular species as a result of success or failure of a particular year class, but we have found this in the earlier years.

Even in walleyes we always had a large number of year classes in a fishery that were supporting a fishery. Now this has narrowed to one and, at the most, two-year classes that contribute to a fishery, so we had virtually complete failure. The environment is just not suitable.

In the case of the blue pike, the environment has changed so drastically that they can't survive at all. As I mentioned, they are a rarity now.

MR. MORR: Is this a cyclical difference in the number of walleyes to be found?

MR. PREMETZ: We have noticed a cycle, yes, but not something that would explain the extreme drop, or explain anything else.

MR. MORR: The purpose of my inquiry is to establish if there might be a cyclical pollution problem, or more cyclical than a siltation problem.

MR. PREMETZ: This I could not answer.

MR. MORR: I just wondered whether you could enlighten me to that extent.

Thank you very much.

MR. STEIN: Thank you.

Mr. Oeming, do you have any questions or comments?

MR. OEMING: Yes, I do, Mr. Chairman. My questions are directed to Mr. Premetz.

You indicated, in answer to Mr. Morr, that scientists earlier had ascribed the decline in fish to other reasons. What were those reasons?

MR. PREMETZ: Well, earlier scientists felt that in many cases it was just a normal aging of the lake, a normal change that takes place in the process, and now, of course, we find the same change is taking place but it has been accelerated.

This is the point we are making here. The environment is changing more rapidly than it would normally change through nature. The earlier changes were through nature.

In any lake, whether we have anyone around it, we are always going to have a change. We are going to have a change in the population in that lake, but man can accelerate this change. He can create an accelerated aging of a lake, and an accelerated change to less desirable species.

MR. OEMING: If I remember correctly, back in the references to investigations of the fishery and Lake Erie, there were some conclusions reached some years ago by the bureau and some international bodies that other things than aging of the Lake were involved.

I wonder if you are familiar with those conditions that were used then as the basis for explaining the decline of the fishery?

MR. PREMETZ: Of course there are various other factors too.

MR. OEMING: Well, let's bring it out in the open.

MR. PREMETZ: All right.

MR. OEMING: Are we talking about over-fishing or poor fish practices? Were those contributing to the decline?

MR. PREMETZ: No. We haven't been able to establish anywhere actually over-fishing, over-exploitation.

MR. OEMING: That was found though in one instance.

MR. PREMETZ: We have had some people that indicated that they felt there was over-fishing. Present day scientists do not agree with them.

MR. OEMING: Thank you.

MR. PREMETZ: In fact, we are learning a lot more about this, and we are learning that we must utilize these resources to a far greater extent than we have if we are going to have a healthy resource.

There are other factors too that have affected fish in the Great Lakes. We have had other species that are coming into the lakes. We have the ailwives, which is an ocean fish. We have the shad, which is an ocean fish. We have the smelt, which is an ocean fish. These fish have all invaded the Great Lakes area and are affecting the native species to some extent.

For example, in Lake Michigan, right at the moment we are seriously concerned about the competition of the ailwives with the native chub in that area. During certain times of the year, they occupy the same zones. The chub at that time are much smaller, they have just hatched, and they are susceptible to the ailwives who prey on them.

There are many factors and there are many things we must still understand. We have not completed the job, but I do want to point out one thing, that there has been a definite relationship established between the eutrophication or the accelerated aging of this Lake and what man has put into the Lake.

Therefore, then, for the sake of the fisheries, we must make some changes in our practices and try to at least halt this change.

Now, there is still more to be done beyond this, certainly.

MR. OEMING: Mr. Premetz, in citing your statistics on the yield of blue pike and walleyes from Lake Erie, do these include the total yields from Lake Erie -- that is, from both Canadian and United States yields?

MR. PREMETZ: No. The figures I have presented here cover only the United States side, the United States waters of the Great Lakes.

MR. OEMING: Would you think that that might affect these figures any, the total yields?

MR. PREMETZ: No. The actual changes have been very, very similar in both.

MR. OEMING: To the same extent?

MR. PREMETZ: No, of course not, because certain species of fish are distributed differently. There may be more on the Canadian side and less on the

United States side, and vice versa, depending on the character of the area. Certain species of fish like the reefs for spawning, and, therefore, they frequent that area.

MR. OEMING: I see. One more question, Mr. Premetz.

You have cited a table which showed some increases in calcium, sodium, potassium and other elements in the Lake, and I wonder if you could ascribe any significance at this time to these increases.

These are chemical increases, and not the dissolved oxygen problem, but I am looking for information about an increase from 31 to 38 parts of calcium, and sodium, 6 to 11 parts.

Can you ascribe any significance to these or relation to the fisheries?

MR. PREMETZ: It has affected fisheries, but I am not as intimately familiar with this aspect of it as our people that are actually doing the research, and this is a question that they should answer.

Now, I don't know. Public Health has some people that have been working on it, I'm sure.

MR. OEMING: Well, yesterday the Public Health Service indicated an increase in chlorides did

did not have any significance.

I am asking now, as a fisheries man, whether you felt differently about this.

MR. PREMETZ: No. From the evidence we have to date, it does not. Some of our people feel that it does, in combination with other elements, but this has not been established yet.

As I say, I can't say.

MR. OEMING: That is, there are many waters, aren't there, where we don't have the same situation in Lake Erie with respect to dissolved oxygen, but we do have the same situation with respect to the present day calcium, and so on, and yield a good fishery?

MR. PREMETZ: Not the same species of fish.

Here is another factor too: We really don't know enough about the tolerance of any particular specie.

MR. OEMING: All right, you have answered my question.

MR. STEIN: Are there any further questions or comments?

Mr. Morr?

MR. MORR: Mr. Premetz, nowhere yet have we mentioned the inclusions that might be made in the low water levels of our Great Lakes. Do you have any conclusions or any testimony that might add to our conference here as to the effects of the low water levels? That is, on our fishery particularly?

MR. PREMETZ: Low water levels have certainly affected the fishing industry in some areas.

For example, in Lake Huron, Saginaw Bay, they haven't been able to get into their docks. They have had to find other places to go to. At the same time, it has compounded the pollution problem in some of these areas too, because of the low water levels, and that has had an effect on the fish in the area too.

MR. MORR: Thank you.

Referring to the expression of your bureau through your testimony here pertaining particularly to western Lake Erie, has your work been more extensive in western Lake Erie than in eastern Lake Erie?

MR. PREMETZ: Yes, it has. Our work has been considerably more extensive in western Lake Erie in our limnological work. We have, however, done work in eastern Lake Erie as well, and also Lake Ontario.

MR. MORR: And you consider conclusively that the western Lake Erie fishery is in a very sad state of affairs?

MR. PREMETZ: Extremely sad state of affairs.

MR. MORR: All right. I have a final question.

As Mr. Stein has mentioned, with relation to the agricultural makeup of the western parts of our States, and finding too the agricultural contribution that might be present from other states in the western Lake Erie area, you did not indicate that was necessarily a primary causative factor, or did I misunderstand your testimony on that point?

MR. PREMETZ: No, I can't, on the basis of recent results.

This is an area we are embarking upon. We are studying this matter of pesticides, determining pesticide levels not only in fish, but also in the bottom sediments. In fact, we are studying this to determine just what is in the sediment and just what might be affecting the fish.

MR. MORR: When will your studies be fairly conclusive?

MR. PREMETZ: These have just been started, and it will take some time.

MR. MORR: Thank you very much.

MR. STEIN: Are there any further comments or questions?

MR. BOARDMAN: I have a question for Mr. Wampler.

MR. STEIN: Mr. Wampler, Mr. Boardman has a question.

MR. BOARDMAN: Mr. Wampler, in your reading of the statement for the Bureau of Outdoor Recreation, you indicated that one of the beaches in Presque Isle State Park in Pennsylvania has also experienced pollution problems which, in a recent case, are becoming progressively worse.

I would be interested in the study that this information was taken from, since, according to our records, as far back or as recent as 1938, all of the Presque Isle beaches in Pennsylvania were polluted by sewage.

Today there are three beaches that are relatively pollution free, and one that is somewhat affected by pollution.

In our estimation, this is an improvement, not a degradation.

Again, as Mr. Stein said, I have put some editorial questions, but we just want to keep the record straight. We would be interested in the reports of degradation of the beaches.

Fred Wampler

MR. STEIN: Mr. Boardman, I never made a remark about you making editorial comments.

MR. BOARDMAN: Well, that was directed to me yesterday, I believe.

MR. STEIN: I didn't say it.

Mr. Wampler?

MR. WAMPLER: Your point is well taken.

I think if we have any studies that we have within the realm of the Bureau of Outdoor Recreation that would enlighten the State of Pennsylvania, you can be assured that we will furnish them.

MR. BOARDMAN: Thank you.

MR. STEIN: Are there any further comments or questions?

(No response.)

MR. STEIN: If not, thank you very much, and I would like to thank the Department of the Interior for a very comprehensive presentation.

Mr. Poston?

MR. POSTON: Before closing the Federal presentation, I would like to ask whether there are any other Federal agencies who would care to be heard at this time?

(No response.)

MR. POSTON: I do not have any further requests, and if there are no other Federal agencies that care to be heard, Mr. Stein --

MR. MORR: Mr. Poston, before we close the Federal record, several thoughts have come to my mind.

In speaking of the Report on Pollution of Lake Erie and its Tributaries, Parts 1, 2, and 3, according to Mr. Megregian yesterday, the report is conclusive as to the interstate nature of the Lake Erie pollution.

Secondly, top priority or the importance of municipal secondary treatment in Detroit, Toledo, and the Cleveland area are noted, and the sources of the industrial contributions are noted.

My question is, on what date was the field work for this report completed? May we know that, since we have the report, and may we assume that the field work is completed, and, if so, when it was?

MR. POSTON: This report was prepared at the specific request of our Secretary for purposes of this particular conference. Our studies are proceeding and, insofar as our Great Lakes Project is concerned, the studies have not been completed.

MR. MORR: They have not been?

MR. POSTON: That is right.

MR. MORR: When might we expect them to be?

MR. POSTON: They will be continued. We would expect to have a completion of this Lake Erie portion within a year.

MR. MORR: I wouldn't want to indicate that the conclusions and recommendations are based upon incomplete studies.

MR. POSTON: We feel that we are able to make these recommendations at this time.

MR. STEIN: Sir, as far as I know, the studies that Mr. Poston is talking about are comprehensive studies, something that the Congress undertook for all the Great Lakes, and Lake Erie is one part of it.

This governs all aspects of water quality. As we proceed in comprehensive studies, we do get sufficient information to proceed with an abatement case and an enforcement case.

The theory is that we do not wait for the completion of all the studies, if we can do something at this time.

MR. MORR: I see.

MR. STEIN: And since we had the request from the Governor and the feeling of the Secretary, evidently the investigators felt they had sufficient information at the present time to come up with these conclusions, but the total study authorized by the Congress on the Great Lakes of course will continue.

MR. MORR: Will there be, Mr. Poston, further studies directed to the contribution from watercraft, both those used recreationally and commercially?

MR. POSTON: I think our final report will include this type of information.

I might say that our comprehensive studies deal not alone with pollution that we have today, but we look into the future, and for this purpose we are trying to look 50 years in the future to determine what the conditions will be at that time, so we will not be caught with conditions such as we have in Lake Erie, where we didn't have any concern for eutrophication of the Lake 10 years ago. We didn't know about this.

MR. MORR: Thank you very much.

MR. STEIN: Mr. Boardman?

MR. BOARDMAN: If I recall correctly, and Mr. Poston can probably tell me whether I do or not, at the May 10th conference, I believe you indicated at that time that the study had come up with no evidence of interstate pollution occurring. Now, today you say it has.

Is there a possibility that when this study is complete you will change your mind again?

MR. POSTON: I don't think at the Governors' Conference -- at the Governors' Conference we did not have evidence that we could trace pollution from one state to the other.

We think, as a result of this report, that we can say this, and this is based upon current studies, upon eutrophication studies of the Lake, and I think our biologists and our chemists, and all of our technical people indicated this in their presentations yesterday.

I do not think that, after making this decision, we are going to have another change, or any change.

MR. STEIN: Mr. Boardman, you, I guess, are a real good editorialist, but I don't understand the assumption of your question about the change in mind.

Where is the change, when a man said several months ago that they don't have the evidence? Now they come in with a report and say they do have the evidence. What is the change? Where is the change in mind, and what is the underlying assumption of the question?

MR. BOARDMAN: It was my understanding, Mr. Stein, from working relatively closely with the Great Lakes Projects, that even at the time of the Governors'

Conference, the majority of the field work had been completed for the Lake Erie study, and that now the biggest portion of the study is the report-writing phase.

MR. STEIN: Well, I don't know that that necessarily assumes a change in mind at all.

The question here was that a few months ago, as I understand their position, they did not believe that the evidence was prepared in a sense where interstate pollution could be shown. Now the project has moved along where evidently the investigators feel that that is the conclusion they can arrive at.

In the logical progression of events in any scientific endeavor, I don't see that that constitutes any assumption of a change of mind anywhere.

Are there any further comments or questions?

MR. HENNIGAN: Mr. Chairman?

MR. STEIN: Yes, Mr. Hennigan.

MR. HENNIGAN: If I may, I would like to make some comments relative to the entire presentation, or at least the conclusions and recommendations, as I understand them.

According to the evidence that I have listened to, the major findings so far are that Lake Erie is over-fertilized, they have a problem of eutrophication and algal blooms; there are critical DO's in a wide area in the central section of the Lake; there are poor or non-existent industrial waste practices; serious water quality problems around the shore exist, particularly at the major metropolitan areas -- that is, Detroit, Toledo, Cleveland, Erie and Buffalo, and this would include DO, algae blooms, coliform counts, floating or settleable solids, toxic wastes, sludge deposits, and refuse disposal; there is serious interference with major water uses, particularly fish and aquatic life, recreation, and esthetic considerations; and the general feeling is that a critical situation exists.

Is this a reasonable summarization of what has been presented?

MR. STEIN: Mr. Poston?

MR. POSTON: I think that is a very reasonable assumption of what has progressed to this point.

I think everyone who has been heard emphasized this, and everybody seems to feel that we should act, and act now, starting right with the first presentation at this conference.

The Governor was very interested in action and in an action program. I think we saw this probably at its worst on our boat trip. We need action, and we need it now.

MR. HENNIGAN: Could I continue for a minute?

MR. STEIN: Go right ahead, surely.

MR. HENNIGAN: In the total recommendations that have been made to date, I would again like to attempt to summarize these.

First, secondary treatment and chlorination, with emphasis on phosphate removal, for all municipal sewage discharges.

Limitation of the use of combined sewers and better control of the overflow structures on existing systems.

Prohibition of solids waste disposal into the Lake.

Regional or area-wide approaches to metropolitan sewage collection and treatment problems.

Improved industrial waste practices based on the premise that all wastes should be reduced as far as practical, and continuous and proper surveillance is needed.

Continuous surveillance system of the water quality of Lake Erie.

Better land-use practices, including the use of insecticides, pesticides, and herbicides, and more research into their effects; and, in some instances, stream flow regulation where indicated in order to improve water quality.

My question on this is, is this a reasonable summarization of the recommendations in the document, excluding the question of jurisdiction?

MR. STEIN: Mr. Poston?

MR. POSTON: I think that is a very reasonable summarization.

MR. STEIN: Are there any further comments or questions?

MR. HENNIGAN: Yes.

There is one thing that concerns me. I think most of these recommendations as presented represented in many instances existent practice. I think they are fundamentally minimum recommendations.

Some things have been raised which concern me as far as watering down some of these recommendations where, I think in most instances, they are absolutely essential if any progress is going to be made at all in the whole question of pollution abatement, or the whole question of improving water quality.

The secondary treatment requirement has been compromised, in reference to an agreement reached at the

Detroit conference, so I wondered whether or not this recommendation could be carried through.

The use of combined sewers and a method of approaching the use of combined sewers is a need that is well recognized. I got the impression that people were floundering around and didn't know what to do about it yesterday.

The question of a regional area-wide approach to --

MR. STEIN: Mr. Hennigan, I don't want to interrupt you, but I think we might, if we are going to arrive at something, take one of your problems at a time.

I wonder if you would clarify this: What do you mean by your statement that the question of secondary treatment at Detroit has been compromised? What do you mean by that?

Do you understand that is so?

MR. OEMING: No.

MR. HENNIGAN: I just read the section of the agreement on Page 17 of the report of Michigan.

On Page 17, it says:

> "All municipalities and industries be required to provide a degree of treatment sufficient to protect all legitimate uses."

MR. STEIN: Yes.

MR. HENNIGAN: To continue:

> "Where the effluent contains significant bacterial loadings deleteriously affecting legitimate water uses, disinfection of the effluent will be required."

Does Number 7 mean secondary treatment? If it does, I withdraw my comment.

MR. STEIN: Well, are you reading the only comment at all?

I don't have that in front of me, but there is, as far as I know, another recommendation that Michigan will take action to implement the Federal report. The Federal report recommends secondary treatment for various municipalities.

I don't understand your problem.

MR. HENNIGAN: Well, there isn't any problem if the question of secondary treatment for all municipal waste discharges into Lake Erie is well understood by everybody.

In the Michigan case, it is part of the agreement which has already been reached. You know better than I do on that, because you were there.

MR. STEIN: Yes.

MR. HENNIGAN: As to the limitations on the combined sewer question, as I said yesterday when somebody raised an issue relative to how do you control combined sewers, we seem to move from rather firm ground to rather shaky ground.

MR. STEIN: Again, I think, if we may take not only this city but other cities where we have met the combined problem, the point is that you can just do what you are physically capable of doing.

Mr. Premetz pointed out that if we stop the deterioration of the Lake we are probably not going to return this Lake overnight, by waving a magic wand, or slapping down of a gavel, and make that Lake what it was 100 years ago.

The point is, you need development; you need research in various areas. We do know that one of the most difficult and vexing problems that we have in the older cities of the country is these combined sewers. We do know that we have come up with solutions to these problems in various cities, notably Washington, D. C., where we feel we are cutting down the stormwater overflow to a real minimum.

The problem that you had in Detroit is a very, very severe one. The problem that you had in Chicago, when we had a case there, is a very severe one.

Recognizing the necessity of meeting the problem and the imperfections of the art, the recommendations at those places is that within a specified time limit -- and I think it was two years in Detroit, and possibly about the same in Chicago -- that they come up with a program for elimination of stormwater overflows.

Now, if you can recommend something that we can adopt today at this conference for Cleveland, or Buffalo, or Erie, or Toledo, we will be glad to do it, and I will recommend that to Detroit and to Chicago, and I am sure the people here will welcome it.

MR. HENNIGAN: Well, as soon as the New York City plan is operating, we will have recommendations for everybody.

The other point, which I think is of some concern, is this question of a regional area-wide approach to metropolitan problems, which was recommended throughout the document in various places, and which I again think is essential to any intelligent approach to metropolitan sewage collection and treatment.

Mr. Stein, you made some remarks relative to whether or not this was a proper recommendation, or something to that effect, in terms of the legality of the recommendation.

MR. STEIN: Let me make the position clear on that, and we can check with the States. I think Mr. Eagle kind of associated himself with that view.

Personally, I strongly agree with those recommendations, and I think that is the only reasonable way of doing it. The point, though, that we have to face here is the authority of either the State -- and I think I know the State laws in the States involved -- or the Federal Government in a regulatory agency, and whether we have the authority to do that.

What we generally are talking about is protection of water quality, and we recommend that certain things have to be done in terms of treatment and collection of wastes to protect water quality.

The way that is done is left up to local option legally. We cannot say whether you go into a multi-county operation, whether you go your separate ways, or whether you have a single city signing contract with the people in the suburbs.

Our experience has been that a regional approach is the most intelligent and most economical approach, and, although some do not employ it, I can't imagine communities not doing it.

As a matter of fact, in the new Federal amendments that are being processed through the Congress now, we will be authorized to give a bonus to a municipality or a group of municipalities in a construction grant if such municipalities have embarked on this regional planning approach, but the device of giving a bonus is quite a different technique in governmental operation and authority than a regulatory agency telling someone they have to do it.

MR. HENNIGAN: I have no further comments.

MR. STEIN: Are there any further comments or questions?

Mr. Morr?

MR. MORR: Mr. Stein, the statement by Mr. K. L. Kollar of the Business and Defense Services Administration, in its conclusion, said that it is therefore incumbent on local government and industry to continue working hand in hand to solve pollution problems where they exist.

May I interpret this then, in your statement of a moment or two ago, that the Department of Health, Education, and Welfare, and Interior and Commerce are looking then to local government and industry to, as soon as propitious and as financing may be arranged, solve pollution problems beginning at the earliest possible moment, where they may exist?

MR. STEIN: Yes, I would agree with that.

Again, you speak of from the State government or from the Federal Government. I do not think that the day to day operation of pollution control can possibly rest with the Federal Government, and I suspect not too much with the State government.

The point is it has to be done, it has to be done on the local level, and, as you see us here now, you may not completely subscribe to the notion, but one of our biggest jobs is disengaging from a case in the Federal Government.

Some of these States have worked with us more closely than others, as Mr. Poole and Mr. Blucher here know. Once we get this on the way, and the State and local governments are operating, we just step back, and just check from time to time to see that that is operating. We are not here every day looking over your shoulders.

We are firmly convinced that water pollution problems, like any other problem, can best be solved by the day to day operation at the lowest local unit of government possible.

MR. MORR: Thank you very much.

MR. STEIN: Mr. Poston?

MR. POSTON: I would like to comment to the effect that our total Federal program is geared to assisting of the States in their operation, and it starts right now with our grant programs.

We have grants for municipalities, to help them build these plants. We have grants to assist the State agencies extend and expand their programs. We have technical assistance which is given to State agencies or industries, or those who have the need, and we presently are starting in on a research program with a big research center to study problems, so that we can give answers to State and local agencies on how to solve their problems.

We have felt that research can be combined for several State areas, and study particular problems of an area, and that these things are all geared to give assistance and not to carry a program.

MR. STEIN: Thank you.

If there are no further comments, I believe this concludes the Federal presentation.

With that, we will stand recessed for ten minutes.

(After a short recess.)

MR. STEIN: May we reconvene?

Our schedule now will call for a lunch recess at about 12:30, just as we had it yesterday.

At the present time, I would like to call on Mr. Oeming for the Michigan presentation.

I should say there is some kind of design for this precedent. We are moving in the Lake, and I am calling on the States from west to east, so we will call on Mr. Oeming of Michigan.

Mr. Oeming.

STATEMENT OF MR. LORING F. OEMING, CONFEREE AND EXECUTIVE SECRETARY, MICHIGAN WATER RESOURCES COMMISSION, LANSING, MICHIGAN

MR. OEMING: Mr. Chairman and fellow Conferees:

The Michigan presentation will consist of three statements, three appearances, and perhaps some statements which I would ask to be read into the record.

The personal appearances will be made by

Loring F. Oeming

Mr. Ralph Purdy, on behalf of the Commission, Mr. Frank Hooper on behalf of the Department of Conservation, and Mr. Leonard J. Goodsell on behalf of the Great Lakes Commission.

With that, Mr. Chairman, I would like to call upon Mr. Ralph Purdy, the Chief Engineer of the Michigan Water Resources Commission, to present the statement on behalf of the Water Resources Commission.

I believe, Mr. Chairman and conferees, you all have a copy of Mr. Purdy's statement.

STATEMENT OF
RALPH W. PURDY
ON BEHALF OF THE
MICHIGAN WATER RESOURCES COMMISSION

Mr. Chairman, Conferees, Ladies and Gentlemen:

I will first outline the Statutory Authority and Legal History.

Statutory Authority

Michigan's legislative effort to control water pollution is summarized as follows:

1. Act 350, P.A. 1865. . . .Conservation Department
2. Act 98, P.A. 1913. . . .Health Department
3. Act 17, P.A. 1921. .. .Conservation Department
4. Act 245, P.A. 1929. . . .Stream Control Commission
5. Act 61, P.A. 1939. . . .State Supervisor of Wells (Conservation Department)

6. Act 117, P.A. 1949, amending (4) above. . . .Water Resources Commission

7. Act 219, P.A. 1949, amending (2) above. . State Health Commissioner

8. Act 40, P.A. 1956 (Drain Code). . . . County Drain Commissioners or Intercounty Drainage Boards

9. Act 306, P.A. 1927, as amended. . . . County Health Departments

10. Act 165, P.A. 1963, amending (4) above. .Water Resources Commission

11. Act 328, P.A. 1965, amending (4) above. .Water Resources Commission

No. 1 was enacted for the protection of fish and fisheries.

No. 2 initiated Health Department supervision of municipal water and sewerage facilities and related developments concerned with public health.

No. 3 The basic Act creating the Conservation Department. This carries a broad grant of authority in the following words found in Section 3: "to prevent and guard against the pollution of lakes and streams within the state, and to enforce all laws provided for that purpose with all authority granted by law."

No. 4. The Legislature's attempt to resolve Health and Conservation Department differences of the late 1920's by the creation of a Stream Control Commission. The Act also provided for compliance under a formal notice, hearing, and order procedure. Unlawful pollution was defined as the discharge to waters of the state as "any waste or pollution of any kind that will tend to destroy fish life or be injurious to public health."

Section 12 of the new Act provided that it should be construed "as ancillary to and supplementing" existing provisions of law governing pollution of lakes and streams "except as the same may be in direct conflict herewith."

The Commission was further required to ascertain, in taking appropriate action, whether the conditions created were "unreasonable and against public interest in view of the existing conditions in any lake, river, stream or other waters of the state."

Monthly meetings were required of the five-member Commission to consist of the Director of Conservation, Commissioner of Health, the Highway Commissioner, the Commissioner of Agriculture, and the Attorney General.

No. 5. This enactment made the Director of Conservation the State Supervisor of Wells (for oil and gas). Among his other duties he was authorized "to prevent waste or damage to oil and gas, the fresh, brine, and mineral waters or to life and property."

No. 6. A Water Resources Commission of seven members was created to replace the Stream Control Commission of 1929. To make up its membership of seven, there was added to the four hold-over ex-officio members heading the Health, Conservation, Agriculture and Highway Departments, three Executive appointees (with Senate approval). The citizen members represent respectively, Industrial Management, Municipalities, and Organized Conservation Groups.

The preservation and encouragement of member departmental activity in this field was continued as was authority to call upon "any officer, board, department, school, university or other state institution for any assistance deemed necessary to the carrying out of this Act."

No. 7. The last series of amendments to (2) above strengthened the Health Department's control of plans, construction, operation and supervision of public water supply, sewerage and sewage treatment facilities. From the standpoint of water pollution control one sentence of the Act is particularly significant:

"The State Health Commissioner shall exercise due care to see that sewerage systems are properly planned, constructed and operated so as to prevent unlawful pollution of the streams, lakes and other water resources of the state."

Authorization "to act as agent to the Stream Control Commission on request" appears in Section 11 of the Act.

No. 8. The Drainage Code, up for further amendments each year, carries in Section 423 its definition of the unlawful use of county drains and intercounty drainage facilities for the carrying of sewage and other wastes. Action under this law has been the lease productive of pollution control results.

No. 9. The basic Act providing for the establishment of county and district health departments authorizes the County Board of Health to exercise the same powers as conferred on boards of health of townships, villages and cities. On this basis the local health departments have adopted and enforced county regulations controlling the installation and operation of private sewage disposal systems.

No. 10. Authorizes state officer to designate a representative from his department to serve in his stead as a member of the Water Resources Commission.

No. 11. Amendments clarify wording in various sections of the basic Water Resources Commission act. Broadens the definition of unlawful pollution to provide for what may become injurious; includes substances which are injurious to the value or utility of riparian lands, and provides that the discharge of any raw sewage shall be considered as a prima facie evidence of a violation. Also a city, village or township which permits or allows the discharge of raw sewage by any of its inhabitants shall be subject to the remedies provided in Section 7 of the act. New penalty section provides for a minimum fine of $500 per day.

Act 245, Public Acts of 1929 as amended through the 1965 regular session of the legislature is attached as Exhibit "A". The amendments provided in Act 328, Public Acts of 1965 are effective 90 days after the adjournment of the present regular session.

Legal History

Prior to 1929 authority of the State of Michigan to abate pollution rested upon a basis of common law. In 1913 the Michigan Supreme Court held in Attorney General ex rel Township of Wyoming vs. City of Grand Rapids, 175 Mich. 503, that the state Attorney General acting under his broad common law powers had the authority to file suits on behalf of the State of Michigan to compel the City of Grand Rapids to abate the public nuisance that it was making in the waters of the Grand River by discharging raw sewage therein. In its decree the Supreme Court ordered that the City construct such works as were necessary to abate the pollution within one year.

In 1929 the Michigan Legislature enacted the Stream Control Commission Act (Act 245, P.A. 1929) establishing a five-member Commission consisting of the Director of Conservation, the State Health Commissioner, the Highway Commissioner, the Commissioner of Agriculture, and the Attorney General. This Act defined unlawful pollution as the discharge to the waters of the state of "any waste or pollution of any kind that will tend to destroy fish life or be injurious to public health". The law further provided the Stream Control Commission with authority to ascertain and take appropriate action where existing conditions in any lake, river, stream or other waters of the state were deemed by the Commission to be unreasonable and against public interest. In order to insure compliance with Stream Commission orders, the statute provided for a formal notice, hearing and order procedure.

The constitutionality and authority of the Stream Control Commission to issue orders requiring the abatement of pollution of the waters of the state were reviewed in City of Niles vs. Stream Control Commission, 296 Mich. 650, decided March 11, 1941. In that case the City of Niles appealed from an order of the Stream Control Commission directing the city to begin construction of a sewage treatment plant for the purpose of preventing the discharge of raw sewage into the St. Joseph River. The Supreme Court sustained the authority of the Commission, validated its order and compelled the City of Niles to comply.

In the course of that decision the court made some notable observations, among which is the following:

"In order to stop pollution of the river, it was necessary for the Commission to take action against the City of Niles, inasmuch as it was the first city in the State on the course of the river below the Indiana cities and thus open the way for suit to compel the Indiana cities to stop pollution of the waters of the river. It is an instance where the State must clean up its own door-yard before being in a position to ask or seek to compel its neighbor to clean up. This was not an arbitrary exercise of power by the Commission but a practical movement toward accomplishment of a most desirable end." (Quoted on p. 157, 305 Mich. Rep.)

However, the most notable series of cases involved the enforcement of the order issued by the Stream Control Commission against the City of Port Huron. On February 11, 1936 the Commission issued an order against the City of Port Huron requiring it "to proceed to the construction of a sewage treatment plant and the necessary collecting and intercepting sewers, pumping stations, force mains and other appurtenances in connection therewith, all when and as approved by the Michigan Department of Health to permit treatment for the sewage of the city before its discharge to State waters". The city failed to comply with this order and the Commission filed a bill of complaint on December 9, 1939 to enforce it. After an extended trial the Circuit Court denied the relief sought by the Commission and the matter was appealed to the Supreme Court. In the course of its opinion (Stream Control Commission vs. Port Huron, 305 Mich. 153), reversing the decision of the lower court and validating the order of the Commission, the Supreme Court referred to the argument made by the city that construction of the sewage plant would not materially reduce pollution in the river and that its present method of sewage disposal did not create a public nuisance to the people residing along the river as well as those in the cities of Marysville, St. Clair, Marine City and Algonac situated within 30 miles below Port Huron. In disposing of this contention, the court stated (p. 157):

> "The record contains sufficient testimony to substantiate the State's contention that the present raw sewage disposal method is a constant menace to the health and well-being of the downriver communities as well as to tourists. This evidence clearly justifies the Commission's order. Under the authority of the City of Niles case, supra, where similar arguments were advanced, it is no defense to a statutory charge of river-water pollution that others have or are contributing to that condition."

A contention made by the city consisted of invoking the doctrines of "balancing of equities" and "comparative injury". These doctrines are always invoked when a number of municipalities or industries contribute to the pollution of a body of waters, each one claiming that it should not be required to abate its contribution to the pollution until the others are required to do likewise. In disposing of this contention the Supreme Court said (p. 157-158):

"Even if we should concur with the trial judge in his conclusion that a 'balancing of equities' favors the city, this is not a proper case for the application of that doctrine. The doctrine of 'comparative injury' should be confined to those situations where the plaintiff can be substantially compensated. This principle is distinguished in City of Harrisonville vs. W. S. Dickey Clay Manfg. Co., 289 U. S. 334, 337 (53 Sup. Ct. 602, 77 L. Ed. 1208)."

* * * *

"The doctrine of 'comparative injury' should not be invoked to justify the continuance of an act that tends to impair public health."

Another contention made by the City of Port Huron was its financial inability to comply with the order. In disposing of this issue against the city, the court stated (p. 159):

"The act creating the Commission was under the police power vested in the State, and the order in question was not arbitrary or unreasonable but became necessary by reason of the previous refusal of the city of Port Huron to stop pollution of the St. Clair and Black rivers. The evidence justified the order of the Commission, and the decree entered below must be vacated.

"We are not unmindful of the situation caused by war conditions and the fact that the city of Port Huron will have difficulty in complying with the Commission's order due to necessary materials now required for war purposes. This, however, does not, and should not, prevent the city from immediately taking those steps necessary to insure the carrying out of the mandate of the Commission, but a reasonable time should be allowed for completion of the project. We apprehend that the State and city can agree upon the time that is necessary, and if they cannot, this is a matter which can be determined by the trial judge upon proper proofs."

The City of Port Huron, however, failed to comply with the order of the Supreme Court and consequently the Attorney General filed a motion for final process to enforce the decree. The court rendered its opinion in People ex rel Stream Control Commission vs. City of Port Huron, 323 Mich. 541. In a per curiam opinion reviewing the events that had occurred including reference to war conditions that had made it impossible for the city to procure necessary materials for construction and that time was required for this purpose, and pointing out that the city had authorized the issuance of bonds totalling $1,600,000 for construction of the sewage disposal plant, the court stated:

"This phase of the situation presents a matter for practical consideration. The problem is one that cannot be solved other than by the construction of proper facilities necessary for the treatment of the raw sewage . . . The condition existing is one, as indicated in the prior opinion of this court, that should be remedied as soon as possible. If the course the city commission claims it is pursuing is followed with reasonable diligence, it seems clear that the desired result can be accomplished in the not far distant future . . . . It seems expedient now that a definite date should be fixed prior to which the sewage disposal plant, the intercepting sewers and other necessary appurtenances shall be completed so that the existing situation may be ended.

"The injunctive relief sought by the motion of the attorney general will be granted effective as of October 1, 1950."

Even this, however, did not end the controversy because the City of Port Huron experienced difficulty in

Ralph W. Purdy

selling the bonds to raise the money for construction of the works. Apparently the bonding houses wanted a decision from the State Supreme Court validating those proposed bonds. Consequently, upon the city treasurer's refusal to countersign the bonds, mandamus proceedings were filed by the mayor of Port Huron against him. The Attorney General intervened as plaintiff and the matter was decided by the Supreme Court in Port Huron Mayor vs. Treasurer, 328 Mich. 99. In its opinion the court reviewed the prior proceedings, the various resolutions and ordinances adopted by the city for the issuance of the bonds, and the court pinpointed the critical issue as follows (p. 106):

"The most important question raised by the pleadings is whether the issuance of the general obligation bonds of $1,300,000 must be approved by a 3/5 majority of the qualified electors of the city of Port Huron after due notice has been given to them in the same manner and to the extent that is required for issuance of other general obligations bonds issued under the charter of the city of Port Huron and by the home rule act."

The bonds had not been submitted to the electors for approval and thus the court was faced with the responsibility of deciding whether its previous orders could be complied with without reference to any referendum for the issuance of the bonds to raise the money needed for compliance with the orders of the Supreme Court. Act 320, P.A. 1927, authorized the legislative bodies of municipalities to issue and sell bonds necessary for the construction of sewage disposal plant "whenever a court of competent jurisdiction in this State shall have ordered the installation of a sewage or garbage disposal system in any of the governmental agencies of municipalities herein mentioned and the plans therefore shall have been prepared and approved by the state commissioner of health.

Another statute known as the Municipal Finance Act, namely Act 373, P.A. 1925, contained the same provision with reference to the construction of "necessary storm and sanitary sewers".

After reviewing the various authorities, the court held that whenever a municipality finds it necessary to raise money for the issuance of bonds for the purpose of complying with a court order involving the public health of the State, no referendum of approval by the people is necessary. Its opinion on this point stated:

"The action of the plaintiffs was in strict accord without peremptory order for the installation of a sewage treatment system in Port Huron. The proposed bond issue was not to raise money for ordinary municipal purposes or improvements, but to carry out the order of this Court, and prevent defendant from further polluting public streams and endangering the health and comfort not only of its own inhabitants but also of all others in any way affected by the pollution of the waters by the filth from the Port Huron sewers. This no longer created solely a problem of Port Huron but one of the State and this may have been the reason for enactment of Act No. 320, supra, sections of which we have quoted. The order was for the protection of the people of the State of Michigan. It transcended local purposes.

"Claims of defendant that notice and vote of the electors of Port Huron were necessary are fully answered by sections 7 and 8 of P.A. 1927, No. 320, supra. The city of Port Huron was bound to carry out the order of this Court, which confirmed the previous order of the Stream Control Commission. There was neither necessity, occasion, nor any reason to publish the resolution authorizing the issuance of the bonds, nor, as previously stated, did it require the vote of 3/5 of the electors." (Emphasis supplied).

Another point raised was that the levying of the tax for the payment of such bonds would exceed the tax limitations provided by the city charter. This is a contention which is usually made by municipalities whenever they are faced with complying with an order of the Water Resources Commission. In its opinion the court rejected this contention by holding that there is ample authority in Act 320, P.A. 1927, to levy taxes for the purposes mentioned in that statute; and that even though the tax limitations were exceeded, such defense was not valid when the city is required to comply with a court order.

The Supreme Court thereupon issued its writ of mandamus ordering the city treasurer to countersign the bonds and in due time the sewage disposal system of the City of Port Huron was built and has been operating ever since.

The series of cases referred to paved the way for enforcement of Water Resources Commission orders and enabled Michigan municipalities to finance construction of projects necessary to comply with Commission orders. Today no municipality in the State of Michigan can plead that it is financially unable to comply with orders of the Water Resources Commission. Financial inability is not a defense against the abatement of a nuisance either by private citizens or by a municipal entity.

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State Program for Control of Water Pollution

The State of Michigan takes pride in its energetic efforts and programs to improve water quality and banish pollution.

While many tasks remain to be done, the programs which have been successfully completed and those now in progress are impressive and evidence a long history of effective water pollution control. The water pollution control policies and programs of the State of Michigan recognize the many uses which water, our most precious resource, must satisfy. The needs of domestic water supply, industry, agriculture, and recreation, including fishing, swimming and boating, must all be considered if water pollution control programs are to receive the public support and confidence required to carry such programs to successful completion. It has been the purpose of Michigan's control programs to effectively upgrade water quality in all areas consistent with local requirements and to abate unlawful pollution deemed to be unreasonable and contrary to the public interest. The legal machinery provided by the State of Michigan is adequate to place under proper control any species of waste discharges where needs can be identified and improvements predicted.

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The record made by the State of Michigan clearly shows that the State has consistently followed effective abatement programs and evidences the readiness at all times of the State to initiate whatever action is required or may be required to correct a violation of State Law.

The need for an investigation and appraisal of the discharges of waste water to the Detroit River and Michigan waters of Lake Erie was recognized by the Michigan Water Resources Commission and an outline of a proposed comprehensive study was prepared in 1961. The survey was to be undertaken and performed by the state. An alternate procedure was selected by then Governor Swainson and by letter dated December 5, 1961, asked, "In accordance with Section 8 of P.L. 660 as amended (P.L. 87-88), I request that you, as Secretary of Health, Education, and Welfare, assist the State of Michigan to identify and recommend methods for correcting the sources of pollution going into the Detroit River and subsequently into Lake Erie".

A conference in the matter of pollution of the navigable waters of the Detroit River and its tributaries within the State of Michigan and Lake Erie was held March 27-28, 1962. At the close of the conference the conferees agreed to the following conclusions and recommendations:

1. Lake St. Clair, the Detroit River, and Lake Erie, within the State of Michigan, and their tributaries within the State of Michigan, are navigable waters within the meaning of section 8 of the Federal Water Pollution Control Act.

2. Pollution of navigable waters subject to abatement under the Federal Water Pollution Control Act is occurring in the Michigan waters of Lake St. Clair, the Detroit River, and Lake Erie, and their tributaries. The discharges causing and contributing to the pollution come from various industrial and municipal sources.

3. This pollution causes deleterious conditions so as to interfere with legitimate water uses, including municipal and industrial water supplies, fisheries resources, commercial and sport fishing, swimming, water skiing, pleasure boating and other forms of recreation.

4. It is too early, on the basis of the record of the Conference, to make an adequate judgment of the adequacy of the measures taken toward abatement of the pollution. The Conference discussions demonstrate that there are many gaps in our knowledge of sources of pollution and their effects.

5. Cognizance is taken of the program of the Michigan Water Resources Commission for development

of adequate pollution control measures on a progressive basis and the excellent progress being made by many municipalities and industries under this program. Delays encountered in abating the pollution may well be caused by the existence of a municipal and industrial complex concentrated in an area with a limited water resource. The conferees are also aware of the vast problems that Detroit faces as a result of the stormwater outflow from a system of combined sewers. The problem thus becomes one of approaching the entire area on a coordinated basis and putting in adequate facilities based on an overall plan.

6. Cognizance is also taken of the six-county study as a useful approach to the solution of the pollution problem in the Detroit area.

7. The Department of Health, Education, and Welfare, in order to close the gaps in the knowledge as to sources of pollution, nature of pollution, and the effects thereof, appropriate methods of abatement, and appropriate methods to avoid delays in abatement, will initiate an investigation and study to gather data and information on the waters involved. This investigation and study will be carried on in close cooperation with the State agencies concerned, with the details of the investigation to be determined by the technical staffs

of the Department of Health, Education, and Welfare, the Michigan Health Department and the Michigan Water Resources Commission. The Department of Health, Education, and Welfare will establish a resident survey group to provide technical assistance for this investigation.

8. The Department of Health, Education, and Welfare will prepare reports on the progress of this investigation at six month intervals which will be made available to the Michigan Water Resources Commission. The Michigan Water Resources Commission will make information contained in these reports available to all interested parties.

9. The Conference will be reconvened at the call of the Chairman with the concurrence of the Michigan Water Resources Commission to consider the results obtained from the investigation and study, and to agree on action to be taken to abate pollution.

A special field unit of the Department of Health, Education, and Welfare working in cooperation with the staffs of the Michigan Water Resources Commission and Michigan Department of Health conducted the intensive comprehensive study. The report of this study written by the staff of the Department of Health, Education, and Welfare was completed and was the subject of the reconvened

Federal Conference June 15 through June 18, 1965. The conference closed with the conferees in agreement on the following conclusions and recommendations:

1. The Detroit River and Lake Erie within the State of Michigan, and their tributaries within the State of Michigan, are navigable waters within the meaning of Section 8 of the Federal Water Pollution Control Act.

2. Pollution of navigable waters subject to abatement under the Federal Water Pollution Control Act is occurring in the Detroit River, the Michigan waters of Lake Erie, and their tributaries within the State of Michigan. The discharges causing and contributing to the pollution come from various industrial and municipal sources.

3. While many sources of waste discharge in the area have adequate facilities, many sources still have inadequate waste treatment facilities. The delays in controlling the pollution problem of the area covered by the Conference are caused by the lack of such adequate facilities and the complex municipal-industrial nature of the problem.

4. Recognition is taken of the excellent work and programming of the Michigan State authorities. Most wastes in the area receive a measure of treatment

or control.

5. The Report on Pollution of the Detroit River and the Michigan waters of Lake Erie and their tributaries, prepared by the U. S. Department of Health, Education, and Welfare, dated April 1965, will be submitted to the Michigan Water Resources Commission for implementation under State and local law. Action taken by the Michigan Water Resources Commission will be reported to the Conferees at six-month intervals at public meetings to be called by the Chairman of the Conference. The Conferees expect that a time schedule for the control of pollution in the area covered by the Conference will be established by the Michigan Water Resources Commission regarding all sources of pollution within one year from the date of the issuance of this summary.

6. The Department of Health, Education, and Welfare will consult with the Michigan Water Resources Commission on action taken under State law by that Commission relating to specific problems of the Detroit River and Michigan waters of Lake Erie. Staff members of the Department of Health, Education, and Welfare will be available for presentation of evidence and testimony at conferences and hearings before the Michigan Water Resources Commission.

7. All municipalities and industries be required to provide a degree of treatment sufficient to

protect all legitimate uses. Where the effluent contains significant bacterial loadings deleteriously affecting legitimate water uses, disinfection of the effluent will be required.

8. Sewerage systems with collection sewers terminating in adequate treatment facilities be provided in those areas along the Michigan shore of Lake Erie and the Detroit River where sewers do not now exist and homes discharge either raw wastes or septic tank effluent to the watercourse.

9. Waste treatment facilities be designed to prevent the necessity of bypassing untreated wastes during maintenance and renovation operations. Cognizance is taken of the fact that many installations provide this protection at the present time.

10. Programs to reduce the likelihood of accidental spills of waste material to the river be continued and strengthened.

11. All municipal waste water treatment plants and industries discharging wastes analyze regularly significant waste constituents contributing to pollution, and furnish such reports and records to the Michigan Water Resources Commission as specified by it.

12. A Department of Health, Education, and

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Welfare water pollution control surveillance station be established in the lower section of the Detroit River. This will be in addition to the Department station now in operation at the head of the Detroit River so as to indicate changes in water quality after improvements are made.

13. Surveillance will be the primary responsibility of the State of Michigan. The Department of Health, Education, and Welfare will assist the State at such times as requested. Surveillance will include regular sampling of waste effluents and overflows from combined sewers as well as aerial and power boat reconnaissance as practiced by the Michigan Water Resources Commission. Expansion of this activity is encouraged and recommended.

14. The Conference may be reconvened on the call of the Chairman.

The Michigan Water Resources Commission at its June 24, 1965 meeting received the recommendations of the conferees and took the following action:

Quoting from our Commission minutes:

"That the municipalities and industries involved be requested to appear before the Commission for conferences to discuss the recommendations in the Federal report and to explore and identify the issues as the basis for a determination of further action to be taken by the

Commission; that the staff of the Michigan Water Resources Commission be instructed to develop proposals for water quality goals to be sought in the Detroit River and Michigan waters of Lake Erie; and that the following procedure and program be pursued:"

1. July 29, 1965, Commission meeting at Lansing: Decision on recommendations requested from Commission staff for water quality goals to be sought in the Detroit River and Michigan waters of Lake Erie, for presentation at August conference with municipalities, industries and other water users.

2. August 25-26, 1965, Commission meeting at Detroit (2 days): Conference on water quality goals, adoption of goals.

3. September 29-30, - October 1, 1965, Commission meeting at Detroit (3 days): Conferences with municipalities and industries in Detroit River area on action to be taken to meet specific individual requirements.

4. November 4, 1965, Commission meeting at Monroe (1 day): Conferences with municipalities and industries in Monroe-Lake Erie area, on action to be taken to meet specific individual requirements.

5. December 15 (Noon) - 16, 1965, Commission

meeting at Lansing (1½ days): Invoke the statutory procedures or other appropriate action disclosed by preceding conferences to be required to establish programs and dates for abatement of pollution determined to be unlawful under State statutes; this may include Notices of Determination and Hearing, Stipulations, etc.

In addition to our prepared text I would like to call to the attention of the Conferees that the Commission schedule calls for the establishment of a time schedule for the control of pollution six months in advance of the date required by the Conferees, or the decision reached by the Conferees at the June 15-18 Detroit Conference.

MR. STEIN: I can applaude at that.

(Laughter).

MR. PURDY: The initial decision on water quality goals was reached on July 29, 1965 as scheduled and it can be anticipated that the remaining portion of the program will proceed as scheduled.

The State of Michigan has assumed its obligation. It will seek by all possible means to achieve and preserve a water quality that is consistent with the myriad needs that are involved. The record shows a continuing dynamic program of progressive water betterment. As valid goals are defined the program will be intensified. The goals however must be framed in the realties of what can be supported by law, for the equities involved may limit the extent to which even the most public spirited organization can go without compulsion.

We are aware of the extensive studies of the Great Lakes system, and in particular those involving Lake Erie now being conducted by the Department of Health, Education, and Welfare under the special authority for such studies provided by Section 2 and 4 f of the Federal Water Pollution Control Act. At the International Level, the governments of the United States and Canada have requested the International Joint Commission to ascertain whether pollution of Lake Erie originating on one side of the border is producing or is likely to produce injury on the other side, and, if so, the extent, causes, and localities of that pollution and the nature and cost of appropriate remedial measures.

The Federal studies as well as the International Joint Commission Investigations can properly be assumed to have been undertaken on the premise that the available store of knowledge has not sufficed as a basis upon which to found oomprehensive action programs or to predict their effectiveness. Deficiencies in present

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knowledge have been broadly identified by the Department of Health, Education, and Welfare as relating to the aging process of the lake as well as to the effects, significance, and possibilities for control of various man-made influences upon the lake water quality.

The protection and enhancement of this great water resource must necessarily be a cooperative effort involving the Federal Government, the several states, and the waste contributing cities and industries. With each of these entities playing its appropriate role, supported by an alert and responsible citizenry, we believe that the orderly processes of investigation and execution which have been initiated and which are being followed by the State of Michigan will lead to the realization of our mutual objectives in the water quality of Lake Erie.

Exhibit "A"

State of Michigan
Water Resources Commission
Act 245, Public Acts of 1929 as amended through 1965 regular session

Sections not amended by Act 328, P. A. of 1965 shown full page width.

Sections amended by Act 328, P. A. of 1965 shown as before amendment in this column	Sections amended by Act 328, P. A. of 1965 shown as amended in this column

An act to create a water resources commission to protect and conserve the water resources of the state, to have control over the pollution of any waters of the state and the Great Lakes, with power to make rules and regulations governing the same, and to prescribe the powers and duties of such commission; to prohibit the pollution of any waters of the state and the Great Lakes; to designate the commission as the state agency to cooperate and negotiate with other governments and agencies in matters concerning the water resources of the state; and to provide penalties for the violation of this act.

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Sec. 1. For the purpose of carrying out the provisions of this act there is hereby created a water resources commission, hereinafter referred to as the commission, which shall consist of the director of conservation, the commissioner of health, the highway commissioner, the director of agriculture, and 3 citizens of the state to be appointed by the governor, by and with the advice and consent of the senate, 1 from groups representative of industrial management, 1 from groups representative of municipalities, and 1 from groups representative of conservation associations or interests, for terms of 3 years each except that of the members first appointed, 1 shall be appointed for a term of 1 year, 1 for a term of 2 years, and 1 for a term of 3 years. Vacancies shall be filled for the unexpired term in the same manner as original appointments. Members of the commission shall be entitled to actual and necessary expenses incurred in the performance of official duties. It shall be the duty of the department of administration to provide suitable office facilities for the use of the commission.

Each of the aforesaid state officers is hereby authorized to designate a representative from his department to serve in his stead as a member of the commission for 1 or more meetings.

Sec. 2. The commission shall organize and make its own rules and regulations and procedure and shall meet at least once each month and shall keep a record of its proceedings. The commission shall protect and conserve the water resources of the state and shall have control of the pollution of surface or underground waters of the state of Michigan and the great lakes, which are or may be affected by waste disposal of municipalities, industries, public or private corporations, individuals, partnership associations, or any other entity. The commission is empowered to make or cause to be made surveys, studies and investigations of the uses of waters of the state, both surface and underground, and to cooperate with other governments, governmental units and agencies thereof in making such surveys, studies and investigations. The commission shall assist in an advisory capacity any flood control district which may be authorized by the legislature of this state. The commission in the public interest shall have the right and duty to appear and present evidence, reports and other testimony during the hearings involving the creation and organization of flood control districts. It shall also be the duty and responsibility of the of the commission to advise and consult with the legislature on the obligation of the state to participate in the costs of construction and maintenance as provided for in the official plans of any flood control district or intercounty drainage district. The commission shall have the authority to, and shall enforce the provisions of this act and shall make and promulgate such rules and regulations as shall be deemed necessary to carry out the provisions of this act. The rules and regulations of the commission shall be promulgated in conformity with the provisions of Act No. 88 of the Public Acts of 1943, as amended, being sections 24.71 to 24.82, inclusive, of the Compiled Laws of 1948.

Sec. 2A. The water resources commission is hereby designated the state agency to cooperate and negotiate with other governments, governmental units and agencies thereof in matters concerning the water resources of the state, including but not limited to flood control and beach erosion control. The commission is further authorized to take such steps as may be necessary to take advantage of any act of Congress heretofore or hereafter enacted which may be of assistance in carrying out the purposes of this act.

The commission shall report to the governor

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and to the legislature at least once in each year any plans or projects being carried on or considered and shall include in such report requests for any legislation needed to carry out any proposed projects or agreements made necessary thereby, together with any requests for appropriations.

Sec. 3. The commission shall be authorized to bring any appropriate action in the name of the people of the state of Michigan, either at law or in chancery as may be necessary to carry out the provisions of this act, and to enforce any and all laws relating to the pollution of the waters of this state.

Sec. 3. The commission shall be authorized to bring any appropriate action in the name of the people of the State of Michigan, either at law or in chancery as may be necessary to carry out the provisions of this act, and to enforce any and all laws relating to the pollution of the waters of this state. Whenever the attorney general deems it necessary, he shall take charge of and prosecute all criminal cases arising under the provisions of this act.

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Sec. 4. The commission or any agent duly appointed by it shall have the right to enter at all reasonable times in or upon any private or public property for the purpose of inspecting and investigating conditions relating to the pollution of any waters of this state. The commission shall have the right to call upon any officer, board, department, school, university or other state institution and the officers or employees thereof for any assistance deemed necessary to the carrying out of this act.

Sec. 5. The commission shall establish such pollution standards for lakes, rivers, streams and other waters of the state in relation to the public use to which they are or may be put, as it shall deem necessary. It shall have the authority to ascertain and determine for record and in making its order what volume of water actually flows in all streams, and the high and low water marks of lakes and other waters of the state, affected by the waste disposal or pollution of municipalities, industries, public and private corporations, individuals, partnership associations, or any other entity. It shall have the authority to make regulations and orders restricting the polluting content of any waste material or polluting substance discharged or sought to be discharged into any lake, river, stream, or other waters of the state. It shall have the authority to take all appropriate steps to prevent any pollution which is deemed by the commission to be unreasonable and against public interest in view of the existing conditions in any lake, river, stream, or other waters of the state.

Sec. 6. It shall be unlawful for any person to discharge or permit to be discharged into any of the lakes, rivers, streams, or other waters of this state any substance which is injurious to the public health or to the conducting of any industrial enterprise or other lawful occupation; or whereby any fish or migratory bird life or any wild animal or aquatic life may be destroyed or the growth or propagation thereof be prevented or injuriously affected or the value of lawfully taken fish or game be destroyed or

Sec. 6. (A) It shall be unlawful for any person directly or indirectly to discharge into the waters of the state any substance which is or may become injurious to the public health, safety, or welfare; or which is or may become injurious to domestic, commercial, industrial, agricultural, recreational, or other uses which are being or may be made of such waters or which is or may become injurious to livestock, wild animals, birds, fish, aquatic life, or plants or whereby the growth or propagation

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impaired as the consequence of said pollution. Any person who shall discharge or permit to be discharged any waste or pollution into any of the waters of this state, in contravention of the above provisions of this section, shall be deemed to violate the provisions of this act. thereof is or may be prevented or injuriously affected: or whereby the value of fish and game is or may be destroyed or impaired.

(B) The discharge of any raw sewage of human origin, directly or indirectly into any of the waters of the state shall be considered prima facie evidence of the violation of section 6 (A) of this act unless said discharge shall have been permitted by an order, rule, or regulation of the commission. Any city, village or township which permits, allows or suffers the discharge of such raw sewage of human origin into any of the waters of the state by any of its inhabitants or persons occupying lands from which said raw sewage originates shall be subject only to the

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remedies provided for in section 7 of this act.

(C) Whenever a court of competent jurisdiction in this state shall have ordered the installation of a sewage disposal system in any township, and the plans therefor shall have been prepared, and approved by the state health commissioner, the township shall have authority to issue and sell the necessary bonds for the construction and installation thereof, including the disposal plant and such intercepting and other sewers as may be necessary to permit the effective operation of such system. Such bonds shall be issued in the same manner as provided for in Act 320, P.A. 1927, being sections 123.241 to 123.253, of the compiled laws of 1948; or any other act providing for the issuance of bonds in townships.

(D) Any violation of any provision of section 6 shall be prima facie evidence of the existence of a public nuisance

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and in addition to the remedies provided for in this act may be abated according to law in an action brought by the attorney general in a court of competent jurisdiction.

(Section 7 before and after amendment is as follows:)

Sec. 7. Whenever in the opinion of the commission any person shall violate or is about to violate the provisions of this act, or fails to control the polluting content or waste discharged or to be discharged into any waters of the state, the commission may notify the alleged offender of such determination by the commission. Said notice shall contain in addition to a statement of the specific violation which the commission believes to exist, a proposed form of order or other action which it deems appropriate to assure correction of said problem within a reasonable period of time and shall set a date for a hearing on the facts and proposed action involved, said hearing to be scheduled not less than 4 weeks or more than 8 weeks from the date of said notice of determination. Extensions of the date of hearing may be granted by the commission or on request. At such hearing any interested party may appear, present witnesses and submit evidence. Following such hearing, the final order of determination of the commission upon such matter shall be conclusive: Provided, That such order may be reviewed de novo in the circuit court for the county of Ingham, in chancery, or for the county in which such alleged violator resides, or for the county in which said alleged violation occurred, upon petition therefor, filed within 15 days after said final order of determination.

Sec. 7. Whenever in the opinion of the commission any person shall violate or is about to violate the provisions of this act, or fails to control the polluting content or substance discharged or to be discharged into any waters of the state, the commission may notify the alleged offender of such determination by the commission. Said notice shall contain in addition to a statement of the specific violation which the commission believes to exist, a proposed form of order or other action which it deems appropriate to assure correction of said problem within a reasonable period of time and shall set a date for a hearing on the facts and proposed action involved, said hearing to be scheduled not less than 4 weeks or more than 8 weeks from the date of said notice of determination. Extensions of the date of hearing may be granted by the commission or on request. At such hearing any interested party may appear, present witnesses and submit evidence. Following such hearing, the final order of determination of the commission upon such matter shall be conclusive unless reviewed in accordance with the provisions of the administrative procedures Act. No. 197 of the public acts of 1952, as amended, being sections 24.101 - 24.110 of the compiled laws of 1948, or any amendment thereto in the circuit court for the county of Ingham, in or for the county in which such person resides, or for the county in which the violation occurred, upon petition therefor, filed within 15 days after the service upon said person of the final order of determination.

(Section 8 before and after amendment is as follows:)

Sec. 8. (A) Whenever any person shall feel himself aggrieved by the restriction of polluting content or waste, or pollution, or any other order of the commission, he shall have a right to file a sworn petition with the commission, setting forth the grounds and reasons for his complaint and asking for a hearing of the matter involved. The commission shall thereupon fix the time and place for such hearing and shall notify the petitioner thereof. At such hearing the petitioner and any other interested party may appear, present witnesses and submit evidence. Following such hearing, the final order of determination of the commission upon such matter shall be conclusive: Provided, That such order may be reviewed de novo in the circuit court for the county of Ingham, in chancery, or for the county in which such alleged violator resides, or for the county in which such alleged violation occurred.

(B) Coincident with the effective data of this amendatory act, it shall be the duty of any person then or thereafter requiring a new or substantial increase over and above the present use now made of the waters of the state for sewage or waste disposal purposes, to file with the commission a written statement setting forth the nature of the enterprise or development contemplated, the amount of water required to be used, its source, the proposed point of discharge of said wastes into the waters of the state, the estimated amount so to be discharged, and a fair statement setting forth the expected bacterial, physical, chemical and other known characteristics of said wastes. Within 60 days of receipt of said statement, it shall be the duty of the commission to make an order stating such minimum restrictions as in the judgment of the commission may be necessary to guard adequately against such unlawful uses of the public waters as are set forth in section 6 above. If the order is not acceptable to the applicant, he may request a hearing on the matter involved, following which the commission's final order of determination in this connection shall be conclusive: Provided, That such order may be reviewed de novo in the circuit court for the county of Ingham, in chancery, or for the county in which such alleged violator resides, or for the county in which said alleged violation occurred, upon petition therefor, filed within 15 days after such final order of determination is adopted: Provided further, That failure to comply with the final order of the commission under this section of the act shall not be considered a violation of this act unless and until such failure results in pollution contrary to section 6 of this act.

Sec. 8 (A) Whenever any person shall feel himself aggrieved by the restriction of polluting content or waste, or pollution, or any other order of the commission, he shall have a right to file a sworn petition with the commission, setting forth the grounds and reasons for his complaint and asking for a hearing of the matter involved. The commission shall thereupon fix the time and place for such hearing and shall notify the petitioner thereof. At such hearing the petitioner any any other interested party may appear, present witnesses and submit evidence. Following such hearing, the final order of determination of the commission upon such matter shall be conclusive unless reviewed in accordance with the provisions of the administrative procedures Act No. 197 of the Public Acts of 1952, as amended, being sections 24.101 - 24.110 of the compiled laws of 1948, or any amendment thereto in the circuit court for the county of Ingham, or for the county in which such person resides, or for the county in which the alleged violation occurred.

(B) On and after May 18, 1949, any person requiring a new or substantial increase over and above the present use now made of the waters of the state for sewage or waste disposal purposes shall file with the commission a written statement setting forth the nature of the enterprise or development contemplated, the amount of water required to be used, its source, the proposed point of discharge of the wastes into the waters of the state, the estimated amount so to be discharged, and a fair statement setting forth the expected bacterial, physical, chemical and other known characteristics of the wastes. Within 60 days of receipt of the statement, the commission shall make an order stating such minimum restrictions as in the judgment of the commission may be necessary to guard adequately against such unlawful uses of the waters of the state as are set forth in section 6. If the order is not acceptable to the user, he may request a hearing on the matter involved, following which the commission's final order of determination in this connection shall be conclusive unless reviewed in accordance with the provisions of the administrative procedures Act. No. 197 of the public acts of 1952, as amended, being sections 24.101 - 24.110 of the compiled laws of 1948, or any amendment thereto in the circuit court for the county of Ingham, or for the county in which the user resides, or for the county in which the use is contemplated, upon petition therefor, filed within 15 days after service upon said user of the final order of determination.

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(Section 9 before and after amendment is as follows:)

Sec. 9. Any duly appointed agent of the commission shall have authority to enforce the provisions of this act and may make criminal complaint against any person violating the same. After service of a written notice of determination setting forth specifically any violation of this act, any person who shall fail to comply with the order of the commission shall be subject to the penalties of this act.

Any person who wilfully violates any provision of this act or any restriction, regulation or final order of determination of the commission made thereunder, shall be subject to a penalty of not to exceed $500.00 per day for each and every day of such violation, such penalty to be recovered in a suit in the circuit court.

Sec. 9. Any duly appointed agent of the commission shall have authority to enforce the provisions of this act and may make criminal complaint against any person violating the same. After service of a written notice of determination, setting forth specifically any violation of this act, any person who shall fail to comply shall be subject to the penalties of this act.

(The following is the new Section 10, there having been no such section 10 heretofore:)

Sec. 10. Any person except a municipality who discharges any substance into the waters of the state contrary to the provisions of section 6 or who fails to comply with any restriction, regulation or final order of determination of the commission made under the provisions of this act shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not less than $500.00 and in the discretion of the court it may impose an additional fine of not less than $500.00 per day for any number of days during which such violation occurred: Provided however, that such person shall not be subject to the penalties of this section if the discharge of the effluent is in conformance with and obedient to a rule, regulation or order of the commission. In addition to the minimum fine herein specified, the attorney general, at the request of the Department of Conservation, is authorized to file a suit in any court of competent jurisdiction to recover the full value of the injuries done to the natural resources of the state by such violation.

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Sec. 11. Whenever the word "person" is used in this act, it shall be construed to include any municipality, industry, public or private corporation, copartnership, firm or any other entity whatsoever. Wherever the words "waters of the state" shall be used in this act, they shall be construed to include lakes, rivers and streams and all other water courses and waters within the confines of the state and also the great lakes bordering thereon.

(Section 12 before and after amendment is as follows:)

Sec. 12. This act shall not be construed as repealing any of the provisions of the law governing the pollution of lakes and streams, but shall be held and construed as ancillary to and supplementing the same and in addition to the laws now in force, except as the same may be in direct conflict herewith.

Sec. 12. This act shall not be construed as repealing any of the provisions of the law governing the pollution of lakes and streams, but shall be held and construed as ancillary to and supplementing the same and in addition to the laws now in force, except

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as the same may be in direct conflict herewith. This act shall not be construed as applying to copper or iron mining operations, whereby such operations result in the placement, removal, use or processing of copper or iron mineral tailings or copper or iron mineral deposits from such operations being placed in inland waters on bottom lands owned by or under the control of the mining company and only water which may contain a minimal amount of residue as determined by the water resources commission resulting from such placement, removal, use or processing being allowed or permitted to escape into public waters; or applying to the discharge of water from underground iron or copper mining operations subject to a determination by the water resources commission.

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Sec. 12. (A) The provisions of this act shall be construed as supplemental to and in addition to the provisions of Act. No. 316 of the Public Laws of 1923, as amended, being sections 261.1 to 277.10, inclusive, of the Compiled Laws of 1948, and nothing in this act shall be construed to amend or repeal any law of the state of Michigan relating to the public service commission, the department of conservation and the department of health relating to waters and water structures, or any act or parts of acts not inconsistent with the provisions of this act.

Thank you.

MR. STEIN: Thank you, Mr. Purdy.

(Applause.)

MR. STEIN: Are there any comments or questions?

MR. POOLE: Mr. Chairman, I have one.

MR. STEIN: Yes, Mr. Poole.

MR. POOLE: Mr. Chairman, I asked this question yesterday, and I am still a little bit confused on just how far this Detroit drainage goes and how it affects us, in any conclusions that we may arrive at here.

Now, the recommendations of your report yesterday were specific in regard to secondary treatment, and I believe that the recommendations of your Detroit report were equally specific, but as I interpret these conclusions that have been read here today, the Michigan Water Resources Commission still has some running room, if you will, in its decision on the degree of treatment that will be required in the Detroit area.

Have I made a fair assumption?

MR. PURDY: Are you asking that of me, Mr. Poole?

MR. POOLE: Well, I would like to know specifically just what the Michigan position is.

MR. PURDY: I can't commit our commission to its position, but it would seem to me that this is a decision that must be reached by our commission, and that a decision of the conferees could not be binding upon our commission.

MR. POOLE: This is the same interpretation I have put on it.

MR. PURDY: In the same way that a decision of the conferees, I don't think, could be binding upon the Indiana Water Pollution Control Board. They have to reach their own decision.

MR. POOLE: It depends on which aspect of the law you get involved in, whether you are discussing interstate waters or intrastate waters.

I have assumed, perhaps wrongly, that if as a result of a conference that involved interstate waters, the conferees agreed on something, and if the Secretary subsequently adopted those agreements, that they would probably overrule any decision that a State agency might make to the contrary.

I am not an attorney, but this has been my interpretation of what the Federal Law is.

MR. PURDY: I don't believe that we are quite at that stage yet on the Detroit River. This was referred back to the State of Michigan.

MR. POOLE: Obviously we are not and we will not be at that stage tomorrow or at the end of next week, whenever we conclude with Lake Erie, but we will be one step down the road in the direction of that stage.

MR. STEIN: Mr. Poole, I have every confidence that with Michigan, the Michigan Water Resources Commission, we won't ever reach that stage, because, as you know, we both have worked with them for many, many years, and I am confident we are going to see eye to eye on it.

Now, you know what the Secretary's position is. You know what the recommendations of HEW have been. We have given a report to the Michigan Commission for implementation. They are proceeding, as far as I can see, in an orderly manner under their statute. They are proceeding more rapidly than we agreed to. They are following this out with complete dispatch.

We all have to recognize here, as I pointed out, that we are operating in a very, very difficult field of Federal - State - local relations, and what we are trying to do is accomplish a cleanup of the

Detroit River, in this case, and its contribution to Lake Erie, within the existing mechanism that we have inherited from our forefathers.

We have the State government and the State commission, the Federal Government and the Federal authorities and agencies, and, of course, the local governments. I think we are proceeding through this complicated government maze with due care and with due prudence, and with a notion of the problems you can get into if you do not touch all your bases.

But I do suspect that the Michigan staff and the HEW staff will come out in complete agreement. I suspect that the cities and industries will be satisfied with that agreement, and I also suspect, and I certainly hope, that the people of the area will be satisfied with improved water as the result.

MR. POOLE: I wouldn't want anyone to construe my earlier remarks as any derogatory statements or feelings with respect to the State of Michigan and its activities.

I have for many years admired its aggressive program, and have attempted to model the Indiana program somewhat along the same lines.

I trust, Mr. Stein, that your summary of the way the situation will develop will be the way that it will actually develop.

MR. STEIN: Are there any further comments or questions?

MR. MORR: Mr. Purdy, briefly, may we assume that the State of Michigan recognizes the quite great contribution to particularly the western area of Lake Erie, to the pollution problem therein, by the Detroit River, and that the State of Michigan recognizes then that there is a degree of responsibility for such conditions as we might find in Lake Erie?

MR. PURDY: The State of Michigan recognizes that injuries are occurring to legitimate water uses in these waters, and they have set forth a program to bring about the correction.

MR. MORR: I understand they have, and for this we are grateful.

Thank you.

MR. STEIN: Are there any further comments or questions?

(No response.)

MR. STEIN: If not, thank you very much for an excellent presentation, Mr. Purdy.

I think we are a little ahead of schedule, which is fine. We probably can do better at lunch.

It is suggested that we reconvene at a quarter to two promptly. We stand recessed until a quarter to two.

(Whereupon, at 12:15 p.m., a luncheon recess was taken.)

AFTERNOON SESSION

2:00 P.M.

MR. STEIN: May we reconvene?

Mr. Oeming?

MR. OEMING: Mr. Chairman and fellow Conferees:

At this time I would like to provide the opportunity for a statement to be presented by Mr. Frank Hooper, who is the Chief Biologist for the Institute for Fisheries Research of the Michigan Department of Conservation.

Mr. Hooper.

STATEMENT OF MR. FRANK F. HOOPER, IN CHARGE, INSTITUTE FOR FISHERIES RESEARCH, MICHIGAN DEPARTMENT OF CONSERVATION

MR. HOOPER: Mr. Chairman, Conferees, Ladies and Gentlemen:

I am Frank F. Hooper, in Charge, Institute for Fisheries Research, Michigan Department of Conservation. I am making this statement on behalf of Dr. Ralph A. MacMullan, Director of the Michigan Department of Conservation.

An earlier statement giving the Michigan Department of Conservation's viewpoint on the pollution of the Detroit River and Lake Erie was presented at the June 15-17, 1965 conference at Detroit. The present statement is intended to emphasize portions of the earlier statement that apply to Lake Erie.

Lake Erie has great significance as a

natural resource. We would like to point out some characteristics of lakes as resources. A lake is more than a tank to store and contain water and waste. It is a natural phenomenon of value in itself. Its ingredients are chemical, biological, physical and esthetic. They include plants, animals, matter in solution and suspension, all brought into association by the medium of water. Because of this combination of characteristics, lakes and streams form a many-faceted resource. The utilization of any one facet can have profound influence upon each of the others. Each use can cause some hazard to the lake or stream itself if carried to excess.

No single use of a lake or stream poses so great a threat to all other values as the disposal of waste. We believe that the concept of disposing of wastes by committing them to lakes and streams ultimately must change. We recognize the enormous financial and economical implications of that statement; nevertheless, we are convinced that the other values of these water resources are such that the day will come when their use for waste disposal will cease by popular demand

FISH

Fisheries resources, both sport and

commercial, are entirely dependent upon water quality. Within the past 30 years, the fisheries resources of Lake Erie have deteriorated rapidly. This deterioration is continuing. Desirable clean-water fish formerly present are fast disappearing, and are being replaced by less desirable, pollution-tolerant species. The evidence is strong that the deterioration of fish resources has come about principally because of environmental changes resulting from pollution. These changes are complex and subtle, and have affected fish life in many ways. Perhaps the most important change is an acceleration of the aging process brought on by the nitrogen and phosphorus compounds present in organic wastes. Enrichment provided by these wastes leads to oxygen depletion, turbidity, temperature increases, and interruption of the biological food chains. In addition, some chemical and industrial wastes contain toxicants directly harmful to fish.

Until recently, Lake Erie was the most productive of the Great Lakes in terms of useful fish. It continues to support a large population of fish, but the composition of that population has changed drastically. The valued blue pike has disappeared; the lake herring and whitefish are almost gone. The walleye is in a precarious state. Of the desirable species, only the yellow perch remains abundant, and there are indications that even this tolerant and prolific species is in trouble.

The new Lake Erie fish population is composed chiefly of species such as carp and sheepshead that are of little commercial value and are of minor interest to sport fishermen.

PARKS AND RECREATION

The U. S. Public Health Service report on the Detroit River and Lake Erie has adequately described the restriction of recreational uses in Lake Erie and its Michigan tributaries arising from pollution. We can add nothing to this statement beyond detailing some of the effects of pollution on parks and other recreation facilities located along the Michigan shoreline of Lake Erie.

Sterling, the only state park on the Michigan portion of Lake Erie, has been closed to swimming since 1961, owing to bacterial contamination of its 7,800-foot beach. Attendance at this park has dropped from 1,239,216 in 1959 to 319,500 in 1964, a decline of approximately 75%. This drop occurred during years when most other state parks were overcrowded to the point that tens of thousands of would-be users were turned away annually. Since March, 1962, we have spent about $500,000 for buildings, roads, water and sewage facilities, and other improvements at Sterling State Park in an effort to provide a badly needed major recreational facility for this heavily populated part of Michigan and for out-of-state visitors entering the state at its southeast gateway. Consideration has even been given to construction of an artificial swimming pool as a feeble substitute for the natural beach. This would be a shameful solution to a problem which should be solved by cleaning up the pollution which necessitates "no swimming" signs.

CONCLUSIONS

The Michigan Department of Conservation wishes to support all policies and steps taken which are aimed at minimizing the rate at which Lake Erie is aging. Fishing and recreation have made the shores of Lake Erie and connecting waters highly desirable sites for urbanization and for cultural development. These advantages will be jeopardized if aging and deterioration of this habitat continues unchecked. Time will likely produce major advances in waste treatment technology. However,

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these advances will be wasted as far as Lake Erie is concerned if in the interim we allow the lake to deteriorate to a point at which it has lost its recreational and esthetic values.

All steps taken now towards collection and treatment of industrial and domestic wastes and toward curtailment of silt and agricultural runoff, can be looked upon as very basic, necessary and preliminary toward more refined processing in the future. Specifically, our immediate goals should be: (1) Water quality which would make available sites on the Michigan shoreline of Lake Erie for all recreational uses, including bathing. Treatment of industrial and domestic wastes entering the lake should make this possible. Although nutrients cannot be entirely eliminated and blooms of algae may on occasion produce nuisances, treatment will, in part, arrest long-range deteriorative changes, and will permit most recreational uses. (2) The elimination of untreated wastes from the western basin of Lake Erie should bring about an improvement in the populations of bottom animals. This in turn should assist in preservation of stocks of species such as perch and walleye, which appear to be on the verge of elimination and will very likely disappear if present trends continue.

Thank you.

MR. STEIN: Thank you, Mr. Hooper.

Are there any comments or questions?

MR. OEMING: I have one.

MR. STEIN: Yes, Mr. Oeming.

MR. OEMING: Mr. Chairman, I would like to point out that Dr. Ralph MacMullan, on whose behalf Mr. Hooper presented this statement, has been and is an active and aggressive member of the Water Resources Commission by statute, and that his views will certainly play a big part in what decisions the Commission reaches with respect to the Detroit River and Michigan waters of Lake Erie report.

MR. STEIN: If this were a court, I could say we will take judicial notice of it. I have seen him in action.

(Laughter.)

MR. STEIN: Thank you.

MR. POSTON: May I ask a question?

MR. STEIN: Yes.

MR. POSTON: Dr. Hooper, I take it that you feel that pollution from Michigan interferes with recreational uses of Lake Erie within Michigan, and also with the fishery in Lake Erie; is this right?

MR. HOOPER: I don't think there would be any question but that that is true.

MR. POSTON: All right. Then, to proceed a little bit further, would you say that this same pollution then interferes with the fishery in other parts of Lake Erie?

MR. HOOPER: I think undoubtedly it does.

MR. POSTON: Then you consider this as interstate pollution?

MR. HOOPER: I can't see how you can consider it otherwise.

MR. POSTON: That is all.

MR. STEIN: Are there any further questions or comments?

MR. OEMING: No questions.

MR. STEIN: All right, thank you.

Mr. Oeming, do you have anyone else?

MR. OEMING: Yes, I do, Mr. Chairman.

I would like to at this time call on Mr. Leonard J. Goodsell, Executive Director of the Great Lakes Commission, to present a statement on behalf of the Great Lakes Commission.

STATEMENT OF MR. LEONARD J.
GOODSELL, EXECUTIVE DIRECTOR,
GREAT LAKES COMMISSION

MR. GOODSELL: Mr. Chairman, Ladies and Gentlemen:

I am Leonard J. Goodsell, the Executive Director of the Great Lakes Commission, based in Ann Arbor, Michigan. And, of course, we make our contribution to the separated sewage system at Ann Arbor that was spoken of a little earlier.

So much has already been said here in this conference that it is a little hard to keep from repeating what has been said, and maybe I can say some of the things with just a little bit different shade of emphasis on some of them.

It is a very great pleasure to appear at this conference. Specifically, I come at the invitation of Mr. Oeming, Executive Secretary of the Water Resources Commission of Michigan, and also Mr. Morr, Director of the Department of Natural Resources of Ohio, but more generally as the representative of the Great Lakes Commission, which is a commission dedicated to the service of the eight states which border on the Great Lakes - Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin - on water resources matters.

I think at this stage of the game too we have reached about a 100 per cent blooming factor. Everything is being hurt. The lakes are not doing just what we want them to do, but I went down to see the ball game last night, and I think it was very kind of the conferees to have that ball game in town while we were here.

MR. STEIN: We planned it that way.

(Laughter.)

MR. GOODSELL: I figured that that was the case. I didn't see Mr. Wampler there. I thought he might be.

But one of the things that struck me on the way down are these beautiful flowing fountains. Let me say too that I went over and had a look at them, and not one of those fountains has gin in it.

(Laughter.)

Now, in some places in the country you will find that the fountains do have gin in them because you don't have enough water to go around.

The other thing is down there at the stadium that grass is just as green a grass as you will see any place in the country, and I might say too that that is probably indicative of the fact that the Great Lakes water will support a fine grass state. So we are not altogether useless.

During the night I was awakened a couple of times by boat whistles, and that made me believe that maybe the boats are moving on the Lake. Navigation is moving on the Lake, so everything isn't wrong yet.

Then, in the fifth inning last night, I thought everything was going along pretty well for Detroit. Detroit came up with nine runs in the fifth, which was a little hard for Cleveland to take.

(Laughter.)

But then this morning we pursued the use of the lakes a little bit further, and we had a caucus during breakfast. There were three of us, and we thought very hard, and we determined during that caucus that Lake Erie water as a source of drinking water is better than the Ohio River at Cincinnati, so that is all for the Great Lakes as of this time --

MR. STEIN: Is that supposed to be a recommendation, Colonel?

MR. GOODSELL: I am just making this as a comparison, Mr. Stein. I think we all have to look at things in a relative manner, you know.

First let me say the Great Lakes Commission is unequivocably against water pollution and for pollution control and abatement. In my dealings with the Commissioners and Advisors of the Commission, I gain the distinct impression that the states appreciate the Federal effort in the control and abatement of pollution.

Mr. Stein and Mr. Poston and you other people of the U. S. Public Health Service, you're doing a grand job in the enforcement field, but in your directing the enforcement effort and the state's trying to do what you tell them to do, I sense a very real void in that we don't know how, in an economical and feasible manner, to accomplish the desired end. This leaves a requirement, probably in the primary interest sphere of other parts of U.S.P.H.S. or Department of Health, Education, and Welfare, for some technical and economic assistance in how to deal with the problems that we face in cleaning up the Lakes.

Congressman Blatnik and Dr. Gordon McCallum, Assistant Surgeon General of U.S.P.H.S., visited with the Commission during our semi-annual meeting in Duluth about 11 or 12 days ago, and they are fully aware of the Great Lakes Commission's interest in pollution control and abatement, and both indicated overwhelming interest in cleaning up and preserving the waters of the Great Lakes system.

Another item: Senate Bill No. 4, as passed by the Senate and amended and passed by the House, now awaiting Congressional conference action the last time I checked -- that is called the Water Quality Act of 1965 -- goes part of the way in providing additional assistance in constructing and improving waste treatment plants.

There are many studies being conducted, and study groups and the like working on the problem of Great Lakes pollution -- but most of these groups are engaged in determining, confirming and reconfirming the fact that the Great Lakes are polluted and that there are several known sources of pollution.

It appears that sometimes the efforts are not entirely coordinated, and that maybe some of the work is not being done with the utmost efficiency in that some duplication of the effort is probably appearing.

I think, Mr. Stein, as a part of your enforcement action here, your group will make some of these same determinations as the reports already presented.

But that means that actions along enforcement lines alone are not enough. We need more action on solution of the many problems which are follow-on to these enforcement conferences.

All of us will agree that a clean, sparkling, high-level Lake Erie is a priceless thing - but there is not one of us in this room that can put a definite value on a clean, sparkling, and high-level Lake Erie. We have got to realize that we will have to accept Lake Erie water and quality standards at somewhat less than 100 per cent pure, whatever that may be, at a cost that we can bear. Somewhere along the line, we've got to apply the judgment factor, and I think this judgment factor was rather apparent from the discussion that took place yesterday afternoon among the conferees.

Some possible solutions just aren't acceptable. If we were to run all the people and all the industry off the Lake right now, we would still have problems of lake pollution and lake aging from the residue and the natural processes. It is obvious, of course, we can't decimate the people and industry along and on the lakes. They must remain here.

This brings up the point that we have got to balance out water use and determine the requirements for water quality. Some of the water has to be used for domestic and sanitary purposes, some has to be used for navigation, some for hydro power, some for fish and wildlife, and some for recreation. We can use some of it over and over again for these purposes.

In some cases these uses of water are essentially non-consumptive, and quality requirements are compatible. Our problem stems from the use and pollution of the water, making it unusable for other purposes, such as sanitary purposes versus domestic consumption, fish habitat, recreation, and the like. We don't know now what are the optimum or minimally acceptable water quality criteria for these various purposes. These are things we should and we will have to learn.

We have problems in the treatment processes for municipal and industrial wastes. Removal or non-generation of nutrients is one of the sticky problems; processes to remove nutrients are only partially effective, and facilities for the collection, handling and treatment are very expensive. Right now, we just don't know what is a good, effective and economical treatment process.

We need some developments in the art of treating sewage. This problem is, I realize, not the major topic at this conference, but if we are not going to squander funds unnecessarily, because we don't know how to treat sewage, we are going to have to have some new development, and this should center in the United States Public Health Service.

What I am saying is that one part of Public Health Service is saying "clean it up," but another part is saying nothing or leaving the "how to do it" part up to the States as their problem.

The apparent solution may be terrifically expensive -- a mistake most costly. So assistance is needed in developing an effective, economical treatment process that will do the clean-up job, to the required standards or criteria.

As an example: The Department of the Interior has just recently, in its experimentation to develop new uses of coal, described a process, now in pilot plant stage, which uses coal as a filter material in sewage treatment. The two-stage filter process is reported to remove almost all suspended solids, to reduce

BOD by 70 to 90 per cent; to remove phosphates in excess of 90 per cent, which is the one we talked about so much; and hard detergents by 90 per cent. The process, too, is advantageous in that, in contrast to bio-oxidation systems, it does not produce nitrates from nitrogen compounds. The total in-plant time for the process is in the order of two to four hours.

Bear in mind that this is information that was gained when somebody was trying to sell something. It may not be 100 per cent correct.

MR. STEIN: Does that make it suspect, Colonel, in our society, that if you are trying to sell something, you have to suspect it?

MR. GOODSELL: But at any rate, to my mind, if these facts are correct -- and I don't know -- and they are derived from a recent Congressional hearing, and you have to more or less assume that you have some honorable people, here is an action directed primarily to the problem of making more use of coal, and I might add that the coal used in the filtration process is fully usable as fuel following its use as a filter. This is a constructive action, and this may point the way for a real breakthrough in the pollution control and abatement process.

Leonard J. Goodsell

The process, if found to have merit by your pollution control people, should be pursued at an expedited pace. A successful process of this type, refined as necessary, will save the municipalities and industries of the lakes region millions of dollars, and will do a job that we are apparently not doing too well now.

We know that you realize in the Public Health Service these needs too -- witness the fact that Mr. Poston soon will be heading up the pollution laboratory in Ann Arbor, and the new fresh water laboratory at Duluth is about to be constructed.

Time-wise we have need for answers long before either of these laboratories can become contributory to the problem's solution. So what can we do in the interim?

Now, according to Dr. Leon Weinberger, Chief, Basic and Applied Sciences Branch, Division of Water Supply and Pollution Control, U. S. Public Health Service, conventional waste treatment plants have a capability as follows:

BOD removal	90%
Total Organic removal	80%
Suspended solids removal	90%
"Hard" detergent removal	50%

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Total phosphate removal	10%
Total nitrogen removal	50%
Dissolved mineral removal	5%

and further, according to Dr. Weinberger, there are several laboratory processes that will improve our treatment processes. Electrodialysis is cited as the most effective. I have cited only this one, electrodialysis, because it just happened to come up with the higher figures in each one of the brackets, as I recall it. Those figures are:

BOD removal	99%
Total organic removal	99%
Suspended solids removal	99%
"Hard" detergent removal	98%
Total phosphate removal	87%
Total nitrogen removal	75%
Dissolved mineral removal	50%

The cost projected for the electrodialysis treatment process is 40 to 50 cents per 1,000 gallons. This is based on the volume of 10 to 20 million gallons per day, and this cost would be in addition to the 10 cents per 1,000 gallons cost of conventional primary and secondary treatment. It is very expensive.

There were other processes that were

discussed here yesterday. I think Mr. Coulter mentioned the process whereby you can use the flocculation and precipitation and come out with about 5 or 10 cents per 1,000 gallons.

Again, according to Dr. Weinberger, we need research and answers in these three areas. I think two of them are specifically applicable to the Great Lakes.

(1) Practicable means of treating municipal wastes and other water-borne wastes to obtain water at a quality suitable for repeated reuse.

(2) Improved methods and procedures to identify and measure the effects of pollutants on various water uses.

(3) Investigation of augmented stream flows to control water pollution not susceptible to other means of abatement.

In other words, that is what can we do as far as dilution, and Dr. Weinberger lists 17 major pollution problems and research needs in water pollution for which current technology falls short. I will not list them here, in the interests of time, because they were all covered in one of the papers.

I speak generally as a layman in the pollution field. May I suggest, however, that this conference be used as a vehicle for getting some answers and assistance in effective, economical treatment methods that will meet our overall objective of cleaning up not only Lake Erie but preserving the other lakes as well. We can't afford not to clean up the lakes -- neither can we afford the ostrich or compartmented approach to the solutions of the many problems connected with cleaning up the lakes.

In Summary:

a. Pollution of the Lakes (Lake Erie) must be controlled and abated.

b. Federal and State agencies are working on pollution control but I think we all agree the problem has gotten ahead of us.

c. We must apparently depart from conventional treatment processes to make headway in cleaning up the lakes.

d. Several processes appear to have promise in meeting and providing solution to some of the difficult problems in the sanitary sewage and industrial waste treatment processes. We must have an economical, effective process.

e. Municipalities and industries may be

saved huge sums of money and get better results if an effective treatment process can be brought to the fore. Time is of the essence.

f. Federal agencies should evaluate the coal filter process and others as they are devised; expedite development of an effective process and get the results to the municipalities and industries of the United States so that we won't be expending huge sums on present day conventional processes that are not adequate and which are too expensive.

Mr. Stein and Mr. Poston, my compliments. You are doing a grand job in enforcement. If you would, please, as a part of your normal enforcement action make it your concern to see that the Federal Government does a thorough job in developing better and less enpensive treatment processes.

I am convinced you probably know many of the answers to many of our current problems. I am sure all the interested parties in the Great Lakes, and not only Lake Erie, will appreciate any help that will help us to clean up the Lakes.

Thank you very much.

MR. STEIN: Thank you, sir.

(Applause.)

MR. STEIN: Colonel, I must admit I am surprised. Until you got to Page 8, in listening to your statement, I never thought that Mr. Poston and I were doing a grand job.

Are there any further comments or questions?

(No response.)

MR. STEIN: Thank you very much, sir.

MR. OEMING: Chairman Stein, I have one more statement that has been presented to me.

I believe Mr. Gerald Goshorn, Superintendent of the Village of Flat Rock Water Department is here. If he is here and wishes to present this statement, I will be happy to have him called up.

MR. STEIN: By the way, as Mr. Goshorn is coming up, and we will make this announcement at the end of today's session, the meeting tomorrow will be in the ballroom across the lobby, on the same floor, and not in this room.

Mr. Goshorn, will you identify yourself, sir?

STATEMENT OF MR. GERALD GOSHORN, SUPERINTENDENT, WATER DEPARTMENT, VILLAGE OF FLAT ROCK, WAYNE COUNTY, MICHIGAN

MR. GOSHORN: Mr. Stein, Gentlemen:

I am Gerald Goshorn, Superintendent of the Water Department of the Village of Flat Rock, Wayne County, Michigan.

I appreciate the opportunity of being called upon to present this statement.

On December 18, 1962, it was necessary to shut down the Flat Rock Water Treatment Plant because of a high concentration of Hexavalent Chromium in the Huron River which serves as our water supply. At about 5 p.m. on that date, the concentration reached 70 ppb (parts per billion). We started every other day sampling of the river at that time for Chromium.

This situation caused us much difficulty in that we supply about ten thousand persons with water. This also resulted in loss of revenue and the start of a law suit because of a broken contract. No action was taken at that time by the appropriate authorities against the persons who dumped the Chromium.

In May of 1963 a sample of floating debris was sent to the Michigan Department of Health for analysis. Although we received no written report we were told verbally that this was a sulfide compound of some type but definitely not harmful. Although the location of this discharge was located the condition has persisted to this date.

On July 7, 1964 we picked up a large dose of Chromium in one of our river samples. This concentration was 53 p.p.b. in one river sample and 120 p.p.b. at the effluent of the French Landing Sewage Plant. The sewage going to this plant has since been diverted to an interceptor and goes to Wyandotte. On June 21, 1965 at 8 p.m. we started getting complaints of a medicinal taste and odor in our water. A sample was taken from our raw water pump about 8:00 a.m. on June 22 which contained 50 p.p.b. of Phenol. River samples taken that afternoon contained no measurable Phenol. This led us to believe the Phenol was dumped sometime on Monday June 21, 1965 and had passed by us Tuesday when the river samples were taken. The Ypsilanti Township

Gerald Goshorn

Water Plant located about twenty miles above us had no difficulty at this time. Nor did they experience any problems with Chromium on previous dates.

This situation again caused us a great deal of trouble due to rumors that the water was poisoned. Also the Water Department employees were accused of laxity in allowing an overdose of Chlorine. Some of our users had to dump large quantities of water for which they demanded reimbursement.

A press release about this situation attributed the Phenol to a surge of water which flushed down a lot of settled Phenol from the bottom of the river. The river is "flushed" at least once a week during the summer months and we had a flood in March without experiencing any problem with Phenol. While we have had minute quantities of Phenol before, it was never a problem until this last occurrence.

The citizens that depend on the Lower Huron River for their water supply are very put out by these occurrences and are demanding some constructive action on the abatement of pollution of their lifeline.

MR. STEIN: Thank you very much.

Are there any comments or questions?

(No response.)

MR. STEIN: If not, thank you very much for your statement.

Mr. Oeming?

MR. OEMING: Mr. Chairman, this concludes the notices I have had of requests for personal appearances here.

I have two communications in addition that I would like to read into the record, and then I would also ask permission to reserve some time tomorrow afternoon for an appearance by Miss Olga Madar of Detroit.

MR. STEIN: Without objection, I think we can make that adjustment. The people from Ohio will be on, I think, but when Miss Madar comes up, if Mr. Oeming requests it, I don't think we should have any difficulty putting her on. That will be done.

MR. OEMING: Now, Mr. Chairman, I would like to read a communication by way of a telegram addressed to you as Conference Chairman, from James I. Rouman, Executive Director of the Michigan United Conservation Clubs.

MURRAY STEIN, CHAIRMAN CONFERENCE ON LAKE ERIE

SHERATON CLEVELAND HOTEL CLEVE

MICHIGAN UNITED CONSERVATION CLUBS, A STATE-WIDE ORGANIZATION OF OVER 60,000 MEMBERS AND THE MICHIGAN AFFILIATE OF THE NATIONAL WILDLIFE FEDERATION, IS UNALTERABLY OPPOSED TO FURTHER DELAY IN THE CLEAN-UP OF LAKE ERIE, THE DETROIT RIVER AND THEIR TRIBUTARIES.

WE CAN NO LONGER IGNORE THE DEPLORABLE CONDITION OF LAKE ERIE. IT IS RAPIDLY BECOMING A CESSPOOL OF MUNICIPAL AND INDUSTRIAL WASTES. ITS VALUE AS A RECREATIONAL RESOURCE HAS BEEN ALMOST TOTALLY DESTROYED, AND UNLESS IMMEDIATE STEPS ARE TAKEN TO REMEDY THE SITUATION, WITHIN A FEW SHORT YEARS THE LAKE WILL BECOME A HYDROLOGICAL WASTELAND AND WILL CONTINUE TO BE EVEN FURTHER DEGRADED.

THREE YEARS AND A TOTAL OF $750,000 HAVE ALREADY BEEN SPENT ON A COMPREHENSIVE STUDY OF THESE WATERS. WE KNOW WHAT THE SITUATION IS AND WE KNOW WHAT SHOULD BE DONE TO CORRECT IT. TRUE THIS WILL COST MONEY, BUT DELAY WILL ONLY INCREASE THE EXPENSE AND LESSEN THE CHANCES FOR ULTIMATE SUCCESS.

THE TIME FOR DEBATE AND ADDITIONAL STUDY HAS COME AND GONE; THIS IS THE TIME FOR ACTION.

WE MUST NOT PERMIT FURTHER DETERIORATION OF THIS ONCE UNTAINTED AND VALUABLE BODY OF WATER. IF LAKE ERIE IS TO BE SAVED AT ALL, CORRECTIVE MEASURES MUST BE UNDERTAKEN WITH DISPATCH. WE OWE IT TO OURSELVES AND FUTURE GENERATIONS TO REVERSE THIS DESTRUCTIVE TREND, AND TO RESTORE LAKE ERIE AND THE DETROIT RIVER TO THEIR FORMER STATUS OF CLEAN AND VALUABLE WATER RESOURCES FOR THE SURROUNDING STATES AND FOR THE NATION.

JAMES I. ROUMAN EXECUTIVE DIRECTOR MUCC

MR. OEMING: I would ask that this be entered into the record.

MR. STEIN: Without objection, this will be done.

I would like to go off the record here.

(Discussion off the record.)

MR. OEMING: I also have, Mr. Chairman, a resolution that was mailed to me by the City of Gibraltar, with a request that it be entered into the record, and, with your permission, I would like to read it.

MR. STEIN: Surely.

RESOLUTION

WHEREAS, The City of Gibraltar has received a written invitation from the Water Resources Commission of the State of Michigan to attend or be represented at the Lake Erie Intrastate Conference to be held on Tuesday, August 3, 1965; and

WHEREAS, The City of Gibraltar attended and participated in a conference held in the City of Detroit on June 15-18, 1965, relative to the pollution of the Detroit River and the Michigan interstate waters of Lake Erie and the tributaries; and

WHEREAS, The City of Gibraltar, through its Officials, is unable to attend the Lake Erie Intrastate Conference; and

WHEREAS, The City of Gibraltar is desirous of communicating with the aforesaid Conference by Resolution.

BE IT RESOLVED That the City of Gibraltar officially spread upon the Minutes of this regularly called meeting a commendation to Governor James A. Rhodes of Ohio, who is responsible for the aforesaid conference.

BE IT FURTHER RESOLVED That the Conference specifically declare that this is the time of action, and urge that Mr. Murray Stein of the U. S. Department of Health, Education, and Welfare, as Chairman of the Conference, and Loring F. Oeming as its Executive Secretary for the Michigan Water Resources, join in leading the Conference to positive action.

BE IT FURTHER RESOLVED That the City of Gibraltar firmly believes that there exists more than sufficient data through studies, research, testings, surveys, investigations and census to prove a complete violation in the pollution of the related waters, and that it would serve no useful purpose whatsoever for continuation of surveys and other related investigations.

BE IT FURTHER RESOLVED That the City of Gibraltar respectfully gives notice that any delay in remedial action will cause irreparable injury and damage to everyone concerned.

BE IT FURTHER RESOLVED That a copy of this Resolution be forwarded to:

Conference on Pollution of Interstate
and Ohio Intrastate Waters of Lake
Erie, Sheraton Cleveland Hotel,
Cleveland, Ohio.

Hon. Governor James A. Rhodes
of Ohio.
Mr. Murray Stein, U.S. Department of Health, Education and Welfare.
Mr. Loring F. Oeming, Executive Secretary, Water Resources Commission, Lansing, Michigan.

Unanimously adopted, approved and passed this 26th day of July, A.D., 1965.

CITY OF GIBRALTAR

s/ CHARLES W. SHUMATE
Charles W. Shumate, Mayor

s/ JESSIE M. MARSH
Jessie M. Marsh, Clerk

MR. OEMING: I would request that this be entered into the record.

MR. STEIN: Without objection, it will be so done.

Are there any comments or questions?

(No response.)

MR. OEMING: I have one request to make, Mr. Chairman, that an exchange of correspondence between me and Dr. John L. Buckley of the Executive Office of the President, Office of Science and Technology, Washington, D. C., dated March 18, 1965, April 14, 1965, and May 4, 1965, be entered into the record.

This exchange of correspondence, Mr. Chairman and conferees, relates to the investigations and studies being made in the Executive Office of the President on the problem of fertilization and nutrients in surface waters across the United States.

MR. STEIN: Without objection, this will be done.

(The correspondence referred to is as follows:)

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY
WASHINGTON

March 18, 1965

Dear Sir:

A section of the Panel on Environmental Pollution is concerned with the undesirable enrichment of waters by man-released compounds of nitrogen and of phosphorus. It is our responsibility to (1) describe the present spatial extent and severity of the problem; (2) consider the relative contributions from various sources -- industrial wastes, municipal sewage, agricultural fertilizers and manures; (3) review present research on the problem, and suggest additional research most likely to be rewarding; (4) evaluate possible means of relieving the problem, and recommend corrective actions where appropriate to be taken within the limits of present knowledge and technology.

We are requesting information from concerned Federal and State agencies, research institutions, and from individuals having known competence in the subject.

We would like to know:

1. What bodies of water are overly enriched in your area -- as apparent by algal blooms and other biotic changes.

2. What are the sources of excessive nutrients (industrial, municipal, agricultural).

3. What are your bases of judging that certain waters contain excessive nutrients, and what are your conclusions regarding the severity of the problem in specific instances.

4. Short case histories of the most critical cases of excessive enrichment of waters which have occurred during this century, particularly in recent years, and trends which may aggravate present conditions.

5. Corrective actions, if any, applied in your area, and your recommendation if additional research or legislative action appears to be necessary.

Our subpanel has been given one additional responsibility: to determine possible deleterious effects resulting from the chlorination of wastes. Any information you may care to provide on the subject will be most welcome.

Our report must be completed by the middle of May, 1965. I would appreciate receiving your reply to my inquiries at your earliest convenience. Furthermore, if it is not too great an imposition, may I have your response in six copies (one for each of the widely scattered members of the subpanel)?

Sincerely,

JOHN L. BUCKLEY

Mr. L. F. Deming
Executive Secretary
Water Resources Commission
Station B
Reniger Building
200 Mill Street
Lansing, Michigan

STATE OF MICHIGAN
WATER RESOURCES COMMISSION
GEORGE W. ROMNEY, GOVERNOR
STAFF OFFICES
200 MILL STREET
TEL. 373-3560
STATION B
LANSING, MICHIGAN 48913

April 14, 1965

Dr. John L. Buckley
Executive Office of the President
Office of Science and Technology
Washington, D. C.

Dear Dr. Buckley:

Thank you for your invitation to contribute comments on our experiences with undesirable enrichment of the aquatic environment by man-released compounds of nitrogen and phosphorus. We welcome the opportunity to participate in your panel's survey and investigation of this important and growing problem.

Your introductory statements lead immediately to a prefacing comment concerning Michigan's unique geographic position in the country. Together with parts of our sister states (Minnesota, Wisconsin, and upper New York) we enjoy an immature area, geologically speaking, which provides us with many natural lakes. Most of these lakes were formed by glacial action and have been aging ever since. We have lakes ranging from the rocky, deep, and clear type to the extinct lakes we are using as muck farms. Over much of lower Michigan our still-developing soils provide runoff comparatively rich in nitrogen and phosphorus. These elements stimulate the growth and production of aquatic plants and algae which contribute importantly to the aging of lakes. Before a lake becomes a marsh or a peat bog it will undergo years of heavy plankton blooms and weed growths which contribute to the physical mass filling the lake.

My point is simply that your first questions and your enumerated panel responsibilities seem predicated on the assumption that man-released sources of nitrogen and phosphorus bear the primary responsibility for the algal blooms and other biotic changes which accompany the aging of lakes. We acknowledge that man-released nutrients accelerate the eutrophication process. However, in the light of present knowledge, we are hesitant to predict the outcome if all or part of these man-released nutrients were eliminated. We are also hesitant to say that some lakes currently bothered by nuisance algal blooms and/or aquatic weeds did not have similar problems a century ago.

With this background established I will take up your questions.

1. Several bodies of water in Michigan are apparently undergoing eutrophication at a very rapid rate. They are widely diversified in character and receive runoff and effluents from a variety of soils and sources. Examples include small impoundments (less than 20 acres) on drains from intensively farmed muck land; large natural lakes (750 acres) receiving similar drainage; a large drowned rivermouth lake (2,000 acres) receiving treated municipal wastes; a medium-sized (300 acres) natural lake receiving treated municipal and paper mill wastes; a 600-plus acre lake receiving treated municipal and food processing wastes; a 150 acre lake receiving treated municipal wastes; and a 400 acre natural lake which receives treated municipal and food processing wastes.

2. In addition to the sources of extra nutrients mentioned above, most of the lakes are ringed with cottages which place their wastes in septic tanks.

How much of the nutrients so discharged ultimately reach the lake via seepage is conjectural.

3. Unfortunately we have not been able to develop chemical criteria which establish a valid limit on the nutrient "carrying capacity" of a lake beyond which nuisance conditions ensue. Because of the range in buffering capacity in our natural waters, the same amount of added nutrients could produce very different algal growth reactions in different lakes. Many other factors also have a bearing on type and amounts of algae produced. This inability to predict accurately and confidently at what nutrient level nuisance blooms will commence makes it extremely difficult to place meaningful restrictions on contributors of man-released compounds of nitrogen and phosphorus.

We are convinced that the problem of eutrophication (and especially high-rate eutrophication involving serious nuisance blooms and severe, accelerated biotic changes) is very important to many aspects of the economy of the United States and especially of Michigan where tourism and lake-shore property development are of major concern. There is little doubt that property on lakes suffering nuisance blooms will be less attractive for recreational use than that on lakes without nuisance blooms.

4. Two case histories of vexing problems are enclosed. Trends are apparent in virtually every phase of man's water-oriented activities to aggravate present conditions. At the same time man is demanding better quality water, his very being places a heavier burden on the water resource.

5. Present state pollution control law does not provide the same basis for restriction of nutrients addition that it does for the regulation of materials that are directly pollutional. Much reduction in nutrient discharge is, of course, accomplished by the requirements that are imposed upon municipal and industrial waste discharges to keep BOD, sediments, and other pollutants within proper limits. However, the mere nourishment of aquatic plant growth is not necessarily contrary to Michigan law as it now stands.

It is believed that in order to provide adequate statutory control over the discharge of nutrient materials, the state law should be amended to include this aspect of waste disposal. A proposal now before the Michigan Legislature would amend the present definition of unlawful pollution by adding the term "creation of a public nuisance" to the prohibited acts.

Other means for bringing nutrient materials clearly within the statute may be considered.

Regardless of statutory authority, the need will remain for:

(a) the development of feasible processes by which nutrients can be removed from waste effluents before they are released to lakes or streams;

(b) the advancement of scientific knowledge from which reasonably accurate forecasts can be drawn on the degree of correction that can be achieved over the nuisance blooms under varying restrictions that might be imposed upon the input of nutrients.

We understand that these needs are the subject of considerable research, nationwide. Whether additional research programs are necessary would be beyond our knowledge.

We shall be glad to provide additional information if desired.

Very truly yours,
LORING F. OEMING
Executive Secretary

CMF:bs

Encl.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY
WASHINGTON

May 4, 1965

Dear Sir:

Your informative letter and copies of pertinent documents have been of great help in our review of the over-enrichment of waters by man-released nutrients and farm wastes. Please know how much all of us on the sub-panel on nitrates and phosphates (a component of the Panel on Environmental Pollution) appreciate your interest and assistance.

Sincerely yours,
DERIC O'BRYAN

Mr. L. F. Oeming
Executive Secretary
State Water Resources Commission
200 Mill Street
Lansing, Michigan 48913

MR. OEMING: Mr. Chairman, I appreciate the opportunity to have presented these statements for Michigan and on behalf of Michigan at this conference.

This concludes our presentation.

MR. STEIN: All right. Thank you very much, Mr. Oeming.

Are there any comments or questions on Michigan's presentation?

(No response.)

MR. STEIN: If not, we will immediately proceed to Indiana.

Mr. Poole.

STATEMENT OF MR. BLUCHER A. POOLE, CONFEREE AND TECHNICAL SECRETARY, INDIANA STREAM POLLUTION CONTROL BOARD, INDIANAPOLIS, INDIANA

MR. POOLE: Mr. Poston, my colleague here on my immediate left, on two or three occasions in the last couple of days started to mention "Lake Michigan" when he was thinking of Lake Erie. I assume that it is because of my close proximity to him.

Blucher A. Poole

We had one of these conferences in March that lasted for several days and involved the south end of Lake Michigan, in which the State of Indiana had a much greater stake than I feel that we have in this Lake Erie conference.

I am very happy to report that we concluded that Lake Michigan conference with a unanimous agreement among the conferees as to what ought to be done with respect to the south end of Lake Michigan, and I am equally hopeful that we can come out with a similar agreement at the close of this conference.

As far as the State of Indiana is concerned, and Lake Erie, it is my feeling that we are way out here on the end of the dog's tail. We have less than 1/35 of the total population of the Lake Erie Basin. It is located, as most of you people undoubtedly know, in the Fort Wayne area, which is more than 100 miles via the Maumee River from Lake Erie.

You have heard much discussion in the last couple of days about this secondary treatment. We have secondary treatment in all of the sewered communities in Indiana that are on the Lake Erie watershed.

We have some industrial waste problems which, in my judgment, are fairly minor as far as the

Maumee River in the immediate vicinity of Fort Wayne is concerned.

As I view the situation today, I don't know that there is a great deal more that the State of Indiana can do to contribute to the improvement of Lake Erie until we get this economical method of a higher grade of sewage treatment that has been referred to by one of the earlier speakers this afternoon.

I am now going to turn the meeting over to Mr. Perry Miller, who is Assistant Director of the Division of Sanitary Engineering of the Indiana State Board of Health, which does the work for the Indiana Stream Pollution Control Board, and Mr. Miller will present the Indiana data.

MR. STEIN: Mr. Poole, I just want to state one jurisdictional fact here.

While what you say about Lake Erie is entirely true, there aren't too many miles from Fort Wayne to the Ohio border.

MR. POOLE: 25.

MR. STEIN: 25?

MR. POOLE: Correct.

MR. STEIN: And at the 26th mile, at least theoretically, this becomes an interstate problem.

MR. POOLE: I understand that.

MR. STEIN: All right, thank you.

STATEMENT OF MR. PERRY E. MILLER, ASSISTANT DIRECTOR, DIVISION OF SANITARY ENGINEERING, INDIANA STATE BOARD OF HEALTH

MR. MILLER: Mr. Chairman, Conferees, Ladies and Gentlemen:

My name is Perry Miller. I am Assistant Director of the Division of Sanitary Engineering, Indiana State Board of Health.

You all have, the conferees at least, a copy of the prepared statement. I would like to read the Summary and Conclusions last, and will start with the second page of the report.

The portion of the Lake Erie drainage system that lies in the State of Indiana is composed entirely of the upper drainage basin of the Maumee River. The drainage area of the Maumee River in Indiana is 1,284 square miles and includes parts of Steuben, DeKalk, Noble, Allen, Wells and Adams counties. The largest city in the basin is Fort Wayne with a population of about 175,000. The estimated 1964 population of the Indiana portion of the basin was 270,000. This is about 20 per cent of the population of the entire Maumee Basin.

The Maumee River originates at the junction of the St. Marys and St. Joseph Rivers within the City of Fort Wayne, The river then flows eastwardly and enters Ohio about 25 miles downstream from Fort Wayne and 108 miles upstream from the mouth of the river at Lake Erie at Toledo, Ohio. The St. Joseph River begins near Hillsdale, Michigan, and flows southwest 60 miles through southern Michigan and northwest Ohio before entering Indiana about 40 miles above Fort Wayne. The St. Marys River originates in Shelby County, Ohio, and flows northwest about 60 miles before entering Indiana southeast of Decatur, Indiana, and about 40 miles southeast of Fort Wayne.

The entire surface area is a glaciated area characterized by low relief and glacial till. A large part of the Indiana area is in general farming.

Appendix I lists the low flow characteristics of the streams in the Indiana portion of the Maumee Basin. This Appendix shows that low flows generally prevail. Based on three years data at the New Haven station on the Maumee River the minimum seven-day discharge is 100 cfs. However, two minimum daily discharges of only 48 cfs occurred in 1964. This represents a total flow of about 31 million gallons per day. Fort Wayne's sewage treatment plant effluent amounted to approximately 22 million gallons per day. It can be seen, therefore, that the low flow in the river was mainly the threated effluent.

The only municipal surface water user in the Maumee Basin in Indiana is the City of Fort Wayne. The water is taken from the St. Joseph River at an intake in the City of Fort Wayne. A storage reservoir is located on the river 13 miles above Fort Wayne which impounds 500,000,000 gallons. A river impoundment at the intake has a capacity of 185,000,000 gallons. The water treatment at Fort Wayne consists of lime-soda softening, primary and secondary flocculation and sedimentation, carbonation, rapid sand filtration, chlorination, ammoniation, fluoridation and taste and odor control with chlorine dioxide and activated carbon. The finished water is of excellent quality.

Industrial development is concentrated in the Fort Wayne area although the Garrett-Auburn-Waterloo-

Butler area north of Fort Wayne has several industrial plants.

BASIN STUDIES

St. Joseph River

The St. Joseph River originates in Hillsdale County, Michigan and flows southwesterly across Ohio and enters Indiana about mile point 41.0 above its confluence with the St. Marys River at Fort Wayne. At this point the drainage area is about 615 square miles. According to the U. S. Geological Survey the average daily discharge here is about 548 cfs, but the minimum seven-day average is 18.6 cfs.

Surveys of the river conducted in 1964-65 by the personnel of the Public Health Service at a point one-half mile east of the Ohio-Indiana state line indicate the following results:

	D.O.*	% Sat.	BOD*	Cl*	NO_3*	NH_3*	Phenols*	Coli.**	F. Strep**
High	12.35	121	8.41	33	2.64	0.56	0.0112	130,000	3,500
Low	4.10	35	1.70	10	2.10	0.40	0	1,400	7
Ave.	8.2	74	4.11	16	2.38	0.48	0.0042	21.600	629

* mg/1

** MPN/100 ml.

Perry E. Miller

This shows that the river is carrying some wastes at the state line. The data from which the above summary was made are in Appendix II.

Between the state line and Fort Wayne the river accepts treated domestic wastes with a population equivalent of 1,700 and an industrial waste load of 3,300 population equivalent. This information is summarized in Appendices III and IV of this report.

The quality of the river just before it enters the Fort Wayne area is shown by the following summary of the data collected in 1964 by the Indiana State Board of Health:

	D.O.*	% Sat.	BOD*	Cl*	NO_3*	PO_4*	Coli.**
High	18.0	187	6.3	35	8.3	4.0	29,000
Low	6.0	53	1.7	10	0.0	0.3	< 100
Ave.	10.3	94	3.3	19	1.7	1.0	3,500

* mg/l

** MPN/100 ml.

Perry E. Miller

The data from which this summary was made are in Appendix V. These data indicate that the quality of the water in the St. Joseph River improved in this stretch of the river. This water is the raw water for the City of Fort Wayne.

The average flow of the St. Joseph River increases from 548 cfs at the state line to 967 cfs at its junction with the St. Marys River to form the Maumee River in Fort Wayne. The minimum seven-day discharge increases from 18.6 cfs to 33.9 cfs at the same locations. Flow data and statistical analyses of these flow data are part of Appendix I of this report.

St. Marys River

The St. Marys River enters Indiana from Ohio at mile point 42.0. The river shows pollution at the state line. A summary of the water quality 5.5 miles west of the Ohio-Indiana state line collected by the Public Health Service in 1964-65 gives the following results:

	D.O.*	% Sat.	BOD*	Cl*	NO_3*	NH_3*	Phenols*	Coli.**	F.Strep.**
High	15.50	204	16.90	50	2.20	3.04	0.0089	132,000	9,000
Low	2.88	27	2.30	29	1.80	1.28	0.0002	3,000	8
Ave.	8.24	81	7.04	40	2.00	2.16	0.0035	16,000	2,500

* mg/l

** MPN/100 ml.

Perry E. Miller

There are no sources of pollution between this station and the state line. The data from which this summary was made are included in Appendix VI.

Between this station and the Fort Wayne area about 780 population equivalent is added to the waste load of the river. A chloride load is added to the river at Decatur from the backwash from the municipal zeolite water softening plant.

I might point out here that in the record yesterday from the Department of Health, Education, and Welfare, that there was reported an oxygen sag below Decatur, that Decatur has a secondary treatment plant, and a survey of this plant in August of 1964 revealed that the BOD was 13 mg/l, suspended solids 15 mg/l, and coliform 3,600.

We consider also that the St. Marys River below Decatur is an intrastate stream.

The river had the following parameters of water quality in 1964 at its entrance in the Fort Wayne area:

	D.O.*	% Sat.	BOD*	Cl*	NO_3*	Coli.**
High	13.5	180	9.0	125	9.2	320,000
Low	4.0	38	2.4	8	0.0	200
Ave.	8.5	83	4.3	66	2.1	23,000

* mg/1

** MPN/100 ml.

At the entrance into the Fort Wayne area the quality of the water is better than at the state line except for the chloride concentration. These data are included in Appendix VII.

The average flow of the river varies from about 557 cfs near the Ohio state line to 573 cfs near its junction with the St. Joseph River in Fort Wayne. The seven-day minimum flow of 10.9 cfs at the state line is based on 13 years of record and the flow of 4.9 cfs at Fort Wayne is based on 29 years of record.

Maumee River

The Maumee River begins within the City of Fort Wayne at the junction of the St. Marys and St. Joseph Rivers. The quality of the water entering the city has been discussed in the previous paragraphs.

This point is 136.2 miles from the mouth of the river at Toledo, Ohio. About 25 miles of the river is within the State of Indiana. The City of Fort Wayne, the third largest city in Indiana, uses the Maumee to dispose of its waste waters.

I might mention here that Fort Wayne has had a river improvement program, whereby they have been clearing the debris from the river. They have been clearing the banks of the river, and providing picnic areas for the people, and they are trying to beautify it so that it can be more readily used by the public.

The present population of Fort Wayne is about 175,000. Table 1 lists the population figures of Fort Wayne and the Maumee River Basin in Indiana.

(Table 1 is as follows:)

TABLE 1

POPULATION DATA

Maumee Basin in Indiana

County	Total Population 1960	Population in Basin 1960
Steuben	17,184	4,146
DeKalb	28,271	27,771
Allen	232,196	211,443
Wells	21,220	500
Adams	24,643	22,893
Noble	28,162	3,000
	Total	269,753

Fort Wayne, Indiana

Year	Population*
1850	4,282
1860	9,121
1870	17,718
1880	26,880
1890	35,393
1900	45,115
1910	63,933
1920	86,549
1930	114,946

TABLE 1 (Cont'd.)

Fort Wayne, Indiana

Year	Population*
1940	118,410
1950	133,607
1960	161,776
1964 (Estimate by Indiana State Board of Health)	174,800

* U. S. Bureau of Census Decennial Census

The City of Fort Wayne is served by a combined sewerage system. Here the City of Fort Wayne has a routine program of checking all the storm overflows within the city three times each week. While this is not a continuous checking, it does provide a reasonable degree of control of the overflow points in the City of Fort Wayne.

The average daily sewage flow is about 22,000,000 gallons per day and all the sewage is given activated sludge-type treatment. The plant produces a high quality effluent. The city at present is planning sewer extensions in the Harvester Ditch area. An application for PL-660 funds for this project is pending. The present plant at Fort Wayne is designed for a flow of 32,000,000 gallons and has capacity to treat the additional load. Allen County is experiencing rapid development and several small plants owned by private utilities are now serving the suburban area. There is one plant of 500,000 gallons daily capacity which was constructed by a private utility in the Fort Wayne area to treat the sewage from large areas of this suburban fringe. Table 2 gives a summary of the sewage treatment plant operational reports for the past two years.

With the exception of December, 1964, here I will only point out that the yearly average for BOD in the primary effluent was 15.33 mg/1, and suspended solids was 11.66 mg/1, and for eleven months of 1964, the average BOD was 15.45 mg/1, and the suspended solids was 9.8 mg/1.

(Table 2 is as follows:)

Table 2

Summary of Fort Wayne Sewage Treatment Plant Operational Reports
City of Fort Wayne - Board of Public Works

	B.O.D.			Suspended Solids			Flow	
	Raw	Final	% Removal	Raw	Final	% Removal	Plant M.G.D.	River M.G.D.
1963								
Jan.	275	21	92.4	286	15	94.7	17.1	50
Feb.	261	15	94.2	343	10	97.0	20.9	102
Mar.	192	13	93.2	352	16	95.5	25.5	2,292
Apr.	225	26	88.4	185	32	82.7	21.7	682
May	216	15	93.1	538	14	97.4	21.6	228
June	232	14	93.9	482	9	98.1	23.8	283
July	228	9	96.0	407	6	98.5	21.7	168
Aug.	251	11	95.6	415	6	98.5	19.4	99
Sept.	250	14	94.4	426	8	98.1	18.5	21
Oct.	297	16	94.7	487	7	98.6	18.0	11
Nov.	260	13	95.0	384	6	98.4	17.4	36
Dec.	280	17	94.0	394	11	97.2	17.8	39
Average	247.25	15.33	93.74	391.58	11.66	96.2	20.28	334.25
1964								
Jan.	247	22	91.1	299	16	94.6	18.5	112
Feb.	282	15	94.7	285	10	96.5	19.2	74
Mar.	197	15	92.4	241	11	95.4	23.7	1,495
Apr.	189	16	91.5	313	14	95.5	30.0	2,722
May	261	14	94.6	298	10	96.6	24.4	527
June	165	15	90.9	154	7	95.5	24.5	243
July	236	15	93.6	174	10	94.2	22.5	127
Aug.	257	18	93.0	182	12	93.4	21.6	72
Sept.	245	14	94.3	265	7	97.3	20.9	62
Oct.	300	13	95.7	460	6	98.7	19.5	38
Nov.	277	13	95.3	548	5	99.1	20.4	46
Dec.								
* Average	241.45	15.45	93.37	292.63	9.8	96.07	22.29	501.63

* 1964 average of 11 months.

Perry E. Miller

The municipal water plant of Fort Wayne disposes of lime sludge from water softening operations by discharging it into the St. Joseph River below the water plant. An engineering firm has been employed to study alternate methods of disposal of this waste.

With the large flow from the Fort Wayne plant and contributions by industries in the area, and the low natural flows in the river, there is a definite depletion of oxygen in the river immediately below Fort Wayne.

The Franke Plating Works, Inc. of Fort Wayne discharges rinse waters from its electroplating operations to a Fort Wayne storm sewer which goes directly to the Maumee River. Its wastes amount to 117,000 gallons per day. The plant's sanitary wastes go to the Fort Wayne sewer system.

I might say here that this is the plant that is responsible for the cyanide that was mentioned yesterday.

We in Indiana, through the Stream Pollution Control Board of Indiana, have what we call a cyanide control regulation which was adopted in 1953. This regulation requires that all concentrated cyanide solutions and compounds be isolated so that there can be no accidental or intentional discharge of these compounds into a sewer system or watercourse.

These plants in Fort Wayne do have these facilities, and this program has been most effective in preventing the discharge of cyanides to streams from other than the normal spent waters.

The International Harvester Company discharges its sanitary sewage and soluble oils to the Fort Wayne city sewers. Most of its other industrial wastes are drained into Harvester Ditch.

I might say here that these other industrial wastes are cooling waters. There are some waters from a paint spray company, and also the truck bodies before they are painted.

Recent analysis of the waste revealed that it is relatively weak. The flow is about 300,000 gallons per day. This waste will go to the City of Fort Wayne's sewage treatment plant when the planned interceptor sewer is completed.

Zollner Corporation and Magnavox Company also contribute small amounts of waste to Harvester Ditch. About 30,000 gallons of wash water is drained into the ditch. These wastes will go also into the new interceptor.

Perry E. Miller

The Gladieux Oil Company also discharges wastes into Harvester Ditch. About 154,000 gallons per day of cooling water drain into the ditch after being given oil removal treatment. The sanitary sewage is disposed of through a septic tank and leaching field.

The Phelps Dodge Corporation manufactures copper wire and associated products. Process wastes are treated in a neutralization pond; however, the effluent from this lagoon is very poor. Analysis of this effluent has shown pH values as low as 2.5 and a copper content as high as 250 mg/l.

Flows of this waste have been gauged at 28,000 gallons per day. The company has retained an engineer to design a new waste treatment system to alleviate this pollution. The company discharges about 324,000 gallons per day of cooling water to Harvester Ditch. The plant's sanitary wastes are treated at the Fort Wayne municipal sewage treatment plant.

The General Plating and Engineering, Inc., Fort Wayne, disposes of 38,000 gallons per day of electroplating wastes into Meyer Road Ditch which is a small tributary of the Maumee River near Fort Wayne. Concentrated cyanide wastes are handled by a chemical disposal firm. The company has been requested to initiate remedial action to remove more contaminants from its wastes. The new interceptor on the Fort Wayne municipal sewerage system will service this plant.

The Parrot Packing Company, Fort Wayne, disposes of its packing house wastes into the Maumee River. At present housekeeping practices such as blood collection, paunch manure recovery and meat scrap recovery are used. Sanitary wastes are treated in a septic tank. The Stream Pollution Control Board held a hearing on February 11, 1964, regarding the pollution caused by this firm. The hearing was continued indefinitely when the company volunteered to connect to the Fort Wayne sewers. The City of Fort Wayne's new interceptor sewer will collect the wastes from this plant and they will be treated in the Fort Wayne sewage treatment plant. The waste flow is about 96,000 gallons per day and the BOD ranges from 530 to 2,000 mg/l. The present quality of the river in this area is shown in Appendix VIII.

I might say here, in summary of that, that of these plants I have enumerated, International Harvester, Zollner, Magnavox, General Plating and Engineering, and Parrot Packing Company will connect to the new Fort Wayne interceptor. The Phelps Dodge Company is designing additional treatment facilities to abate pollution.

The Town of New Haven, population 3,396 (1960),

Perry E. Miller

is served by a combined sewerage system and the sewage is given treatment in a trickling filter-type sewage treatment plant. About 343,000 gallons per day are treated. Plant operation is good. The plant was designed for a flow of 750,000 gallons per day.

The B. F. Goodrich Company has a tire plant below New Haven on the Maumee River. Sanitary wastes are treated in an extended aeration-type activated sludge plant and the flow is about 15,000 gallons per day of good effluent. The industrial wastes which amount to 250,000 gallons per day are given treatment in a settling basin with oil skimming equipment. Solids are disposed of by a commercial scavenger. The discharge to stream has a BOD of 13.0 mg/1 and an oil content of 8.8 mg/1.

The water quality of the Maumee River as it leaves Indiana and enters Ohio is shown by the following summary of the data collected for the year 1964 at a station 5.5 miles west of the state line. Since there are no known sources of pollution in this reach the water at the state line should be better than shown in the table.

	D.O.*	% Sat.	BOD*	Cl*	Coli.**	F.Strep.**	Phenols*	NO_3*	PO_4*
High	20.1	144	8.3	74	700,000	6,100	0.013	6.8	28.0
Low	3.7	32	1.7	10	600	112	0	0.2	0.1
Ave.	7.9	75	4.8	36	69,000	2,480	0.006	2.9	4.7

* mg/1

** MPN/100 ml.

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The complete data are shown in Appendix IX. These data indicate that the river has recovered from an oxygen deficiency below Fort Wayne by the time it reaches the state line. The bacterial content, however, remains rather high. To document the oxygen recovery below Fort Wayne, the following summary of data collected during the past nine months is presented:

Station	Distance Below Fort Wayne Sewage Treatment Plant	Distance to State line	Dissolved Oxygen	BOD
New Haven	5 miles	21 miles	4.7 mg/1	7.9 mg/1
Platter Road	12 "	14 "	6.6 "	7.3 "
Ind. Rte. 101	20.5 "	5.5 "	8.0 "	6.8 "
Antwerp, Ohio	39 "	13 " (below state line)	9.6 "	6.8 "

Perry E. Miller

These data indicate that oxygen levels have recovered from the depression caused by the Fort Wayne loadings and that the BOD is stabilized. Except for the nutrient load, it would appear that the water quality of the waters of the Maumee Basin is equal to or better than those entering the state.

Now to go back to the first page of the report, which is the Summary and Conclusions.

SUMMARY AND CONCLUSIONS

1. The waters of the Maumee River when they leave the State of Indiana are of about as good quality as presently known economic sewage treatment technology can provide, but there will be further improvement when the Parrot Packing Company and several industries in the Harvester Ditch area are connected to the Fort Wayne sewage treatment plant.

2. All municipalities with sewerage systems are providing secondary treatment with the exception of Avilla which has such facilities under construction.

3. Sanitary sewage from industrial plants in the basin is discharged to municipal plants or is treated at the plant site. Untreated industrial wastes which are significant will be connected to the Fort Wayne

sewage treatment plant or treated in separate facilities now being planned.

4. The Board's water quality monitoring program has a sufficient number of stations to determine the quality of the waters in the Indiana portion of the basin. The Board has conducted extensive surveys in the past three years to augment the regular water quality monitoring program in the Maumee River Basin.

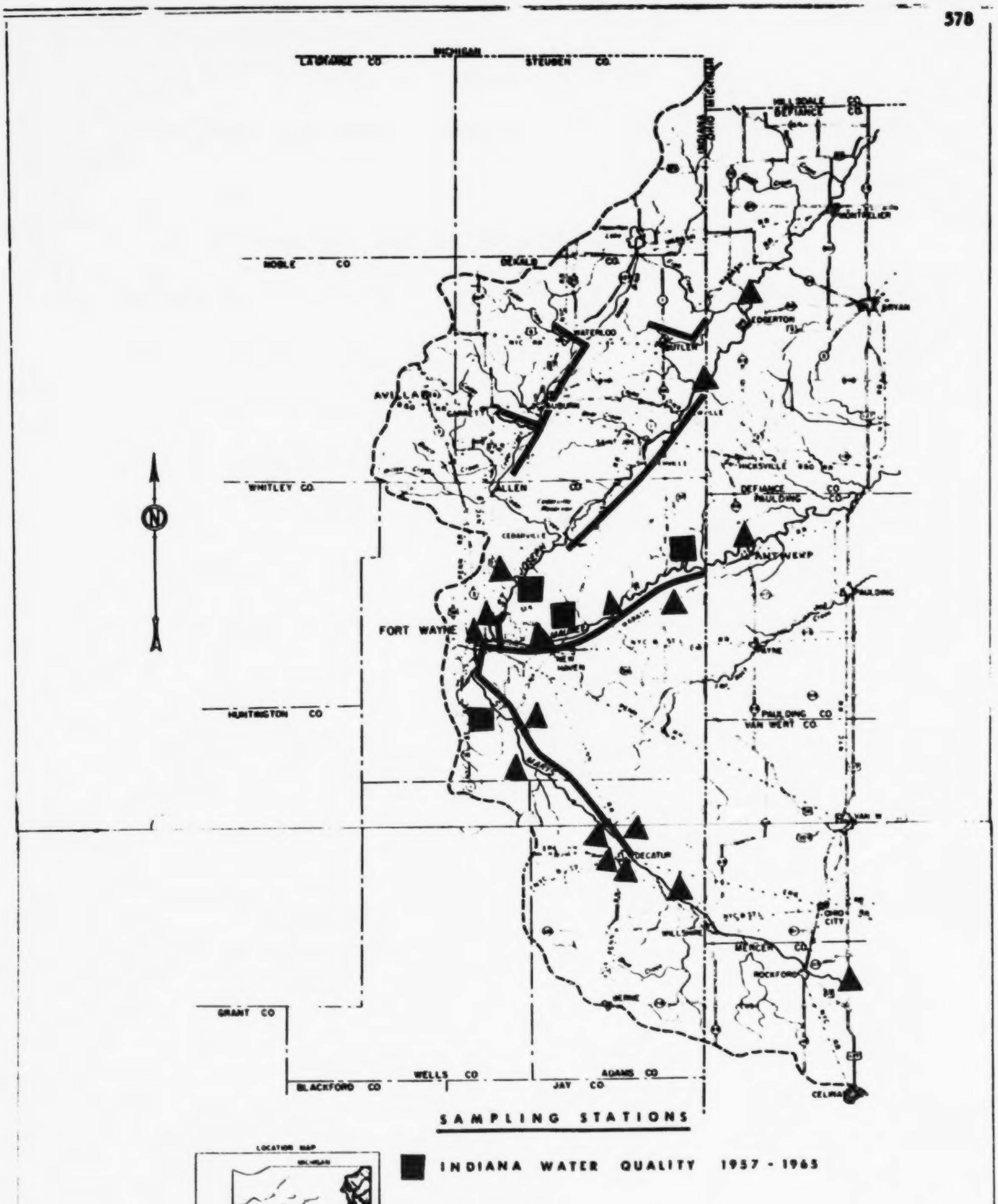
5. The Indiana Stream Pollution Control Law is adequate to achieve the desired water quality.

Thank you.

MR. STEIN: Thank you.

(Applause.)

(The following are the appendices to the above report:)


MICHIGAN
LAGRANGE CO
STEUBEN CO
HILLSDALE CO
DEFIANCE CO
INDIANA
OHIO
MICHIGAN
MONTPELIER
NOBLE CO
DEKALB CO
BRYAN
EDGERTON
WATERLOO
BUTLER
AVILLA
AUBURN
WHITLEY CO.
ALLEN CO
HICKSVILLE
DEFIANCE CO
PAULDING CO
CEDARVILLE
ANTWERP
PAULDING
FORT WAYNE
NEW HAVEN
HUNTINGTON CO
PAULDING CO
VAN WERT CO
VAN W
DECATUR
OHIO CITY
WILLSHIRE
MERCER CO
ROCKFORD
BERNE
GRANT CO
WELLS CO
ADAMS CO
BLACKFORD CO
JAY CO
CELINA
N
SAMPLING STATIONS
■ INDIANA WATER QUALITY 1957 - 1965
▲ PHS SURVEYS 1964 - 1965
ISBH INTENSIVE SURVEYS 1963-64-65
LOCATION MAP
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
MAUMEE RIVER BASIN IN INDIANA
GENERAL MAP
SCALE IN MILES
STREAM POLLUTION CONTROL BOARD STATE OF INDIANA

Appendix I

Low-Flow Characteristics of Indiana Streams In the Maumee Basin

Taken from the "Low-Flow Characteristics of Indiana Streams," published jointly by the United States Geological Survey and the Indiana Stream Pollution Control Board in 1962.

STREAMS TRIBUTARY TO LAKE ERIE

4-1780. St. Joseph River near Newville, Ind.

Location.--Lat 41°23'10", long 84°48'05", in Ohio, in SW¼ sec. 18, T. 5 N., R. 1 E., on left bank 20 ft downstream from bridge on Ohio State Highway 249 and 3½ miles northeast of Newville.

Drainage area.--614 sq mi.

Records used.--Frequency, 1947-58. Duration, 1948-59.

Average discharge.--13 years, 548 cfs.

Extremes in daily discharge.--1946-59: Maximum, 3,450 cfs Apr. 6, 1950; minimum, 18 cfs Sept. 30, Oct. 1-3, 11, 14, 15, 18, 1953; minimum 7-day average, 18.6 cfs Sept. 28 to Oct. 4, 1953.

Magnitude and frequency of annual low flow

Period (Consecutive days)	Lowest average flow, in cubic feet per second, for indicated recurrence intervals, in years									
	1.05	1.1	1.5	2	5	10	20	30	40	50
3		64	38	30	21	18				
7		67	40	32	22	19				
15		75	44	35	23	20				
30		95	52	39	25	21				
60		158	74	54	30	23				
120		260	125	88	46	34				
183		435	200	140	74	56				

Days of duration of discharge

Cfs	Days equaled or exceeded		Percent of Time	Cfs	Days equaled or exceeded		Percent of Time
	Total	Accumulated			Total	Accumulated	
18	99	4,383	100.0	490	294	1,258	28.7
25	179	4,284	97.7	680	225	964	22.0
35	306	4,105	93.7	940	184	739	16.9
48	327	3,799	86.7	1,300	176	555	12.7
67	407	3,472	79.2	1,800	175	379	8.6
93	375	3,065	69.9	2,500	143	204	4.7
130	301	2,690	61.4	3,500	42	61	1.4
180	388	2,389	54.5	4,900	14	19	.4
250	398	2,001	45.7	6,800	5	5	.1
350	345	1,603	36.6	9,500			.0

STREAMS TRIBUTARY TO LAKE ERIE

4-1820. St. Mary's River near Fort Wayne, Ind.

Location.--Lat 41°00', long 85°07', in NE¼ sec. 12, T. 29 N., R. 12 E., on left bank 130 ft downstream from highway bridge, 4 miles south of Fort Wayne, and 12 miles upstream from confluence with St. Joseph River.

Drainage area.--753 sq mi.

Records used.--Frequency, 1931-58. Duration, 1932-59.

Average discharge.--29 years, 573 cfs.

Extremes in daily discharge.--1930-59: Maximum, 13,000 cfs May 19, 1943; minimum, 3.4 cfs Oct. 19, 1934; minimum 7-day average, 4.9 cfs Oct. 15-21, 1934.

Remarks.--Flow regulated by Grand Lake Reservoir. Slight diversion from or into Wabash River basin and into Miami & Erie Canal.

Magnitude and frequency of annual low flow

Period (Consecutive days)	Lowest average flow, in cubic feet per second, for indicated recurrence intervals, in years									
	1.05	1.1	1.5	2	5	10	20	30	40	50
3	34	30	19	15	9.3	6.8	5.4	4.7		
7	38	32	21	17	10	7.5	5.8	5.1		
15	43	36	24	19	12	8.8	7.1	6.4		
30	60	49	29	22	14	11	10	9.6		
60	118	85	42	32	19	15	13	12		
120	295	190	79	55	30	23	18	17		
183	530	345	134	90	47	35	28	26		

Days of duration of discharge

Cfs	Days equaled or exceeded		Percent of Time	Cfs	Days equaled or exceeded		Percent of Time
	Total	Accumulated			Total	Accumulated	
3.4	4	9,862	100.0	270	766	3,740	37.9
5.2	28	9,858	100.0	420	687	2,974	30.2
8	133	9,830	99.7	650	619	2,287	23.2
12	499	9,697	98.3	1,000	579	1,668	16.9
19	948	9,198	93.3	1,600	398	1,089	11.0
30	1,027	8,250	83.7	2,400	366	691	7.0
47	866	7,223	73.2	3,700	232	325	3.3
72	865	6,357	64.5	5,800	80	93	.9
110	836	5,492	55.7	9,000	13	13	.1
170	916	4,656	47.2	14,000			.0

STREAMS TRIBUTARY TO LAKE ERIE

4-1830. Maumee River at New Haven, Ind.

Location.--Lat 41°05', long 85°01', in SW$\frac{1}{4}$ sec. 1, T. 30 N., R. 13 E., in center of span on downstream side of county road bridge, a quarter of a mile upstream from Wabash Railroad bridge, half a mile north of New Haven, and 6 miles downstream from confluence of St. Marys and St. Joseph Rivers.

Drainage area.--1,940 sq mi.

Records used.--Duration, 1957-59.

Average discharge.--3 years, 1,799 cfs.

Extremes in daily discharge.--1946-59: Maximum, 18,900 cfs Feb. 16, 1950. 1956-59: Minimum, 92 cfs Sept. 20, 1959; minimum 7-day average 100 cfs Oct. 9-15, 1956. *

Remarks.--Flow regulated by powerplant above station and slightly regulated by upstream reservoirs. Discharge was not computed prior to Sept. 7, 1956, when gage height was below 5.0 ft.

Days of duration of discharge

Cfs	Days equaled or exceeded		Percent of Time	Cfs	Days equaled or exceeded		Percent of Time
	Total	Accumulated			Total	Accumulated	
80	9	1,095	100.0	1,400	39	369	33.7
100	26	1,086	99.2	1,700	30	330	30.1
120	38	1,060	96.8	2,000	44	300	27.4
140	60	1,022	93.3	2,500	37	256	23.4
170	50	962	87.9	3,000	32	219	20.0
200	36	912	83.3	3,500	39	187	17.1
250	69	876	80.0	4,000	25	148	13.5
300	57	807	73.7	4,500	25	123	11.2
350	37	750	68.5	5,000	30	98	8.9
400	26	713	65.1	6,000	21	68	6.2
450	32	687	62.7	7,000	11	47	4.3
500	40	655	59.8	8,000	11	36	3.3
600	42	615	56.2	10,000	7	25	2.3
700	44	573	52.3	12,000	5	18	1.6
800	57	529	48.3	14,000	10	13	1.2
1,000	56	472	43.1	17,000	3	3	.3
1,200	47	416	38.0	19,000			.0

* The minimum daily discharge of 48 cfs occurred on two days, October 6 and October 13, 1964.

STREAMS TRIBUTARY TO LAKE ERIE

4-1805. St. Joseph River near Fort Wayne, Ind. (Discontinued)

Location.--Lat 41°10', long 85°04', in SW¼ NW¼ SE¼ sec. 4, T. 31 N., R. 13 E., on right bank at upstream side of bridge on Mayhew Road, 3½ miles downstream from Cedar Creek, and 8 miles northeast of Fort Wayne.

Drainage area.--1,060 sq mi.

Records used.--Frequency, 1941-54. Duration, 1942-55.

Average discharge.--14 years, 967 cfs.

Extremes in daily discharge.--1941-54: Maximum, 11,900 cfs Apr. 7, 1950; minimum, 27 cfs Aug. 21, 1941; minimum 7-day average, 33.9 cfs Aug. 18-24, 1941.

Remarks.--Flow regulated by Cedarville Reservoir beginning Sept. 2, 1954. This station was discontinued Sept. 30, 1955.

Magnitude and frequency of annual low flow

Period (Consecutive days)	Lowest average flow, in cubic feet per second, for indicated recurrence intervals, in years									
	1.05	1.1	1.5	2	5	10	20	30	40	50
3		123	86	71	46	36				
7		138	94	77	50	40				
15		152	103	84	55	43				
30		200	118	92	61	50				
60		375	174	128	77	61				
120		580	243	175	100	80				
183		860	360	245	131	104				

Days of duration of discharge

Cfs	Days equaled or exceeded		Percent of Time	Cfs	Days equaled or exceeded		Percent of Time
	Total	Accumulated			Total	Accumulated	
36	18	5,113	100.0	760	325	1,683	32.9
48	101	5,095	99.6	1,000	344	1,358	26.6
66	245	4,994	97.7	1,400	228	1,014	19.8
86	513	4,749	92.9	1,900	243	786	15.4
120	470	4,236	82.8	2,600	192	543	10.6
160	540	3,766	73.7	3,500	173	351	6.9
220	385	3,226	63.1	4,800	112	178	3.5
300	371	2,841	55.6	6,500	50	66	1.3
410	410	2,470	48.3	8,800	16	16	.3
560	377	2,060	40.3	12,000			.0

STREAMS TRIBUTARY TO LAKE ERIE

4-1815. St. Mary's River at Decatur, Ind.

Location.--Lat 40°51', long 84°56', in SW¼ sec. 27, T. 28 N., R. 14 E., on right bank 10 ft downstream from bridge on U. S. Highway 27, half a mile north of city limits of Decatur, and half a mile upstream from Holthouse ditch.

Drainage area.--615 sq mi.

Records used.--Frequency, 1947-58 and extended to 1931-58 on basis of relation with St. Marys River near Fort Wayne. Duration, 1948-59.

Average discharge.--13 years, 557 cfs.

Extremes in daily discharge.--1946-59: Maximum, 10,600 cfs Feb. 15, 1950; minimum, 9.2 cfs Sept. 12, 1955; minimum 7-day average 10.9 cfs Sept. 8-14, 1955.

Remarks.--Flow regulated by Grand Lake Reservoir. Slight diversion from or into Wabash River and into Miami & Erie Canal.

Magnitude and frequency of annual low flow

Period (Consecutive days)	Lowest average flow, in cubic feet per second, for indicated recurrence intervals, in years									
	1.05	1.1	1.5	2	5	10	20	30	40	50
3	33	27	17	14	9.2	7.4	6.2			
7	36	30	19	15	9.9	7.9	6.6			
15	42	34	21	17	11	9.0	7.5			
30	48	39	23	19	13	11	9.5			
60	91	69	36	27	17	14	13			
120	240	150	64	46	26	20	17			
183	460	290	110	72	40	31	25			

Days of duration of discharge

Cfs	Days equaled or exceeded		Percent of Time	Cfs	Days equaled or exceeded		Percent of Time
	Total	Accumulated			Total	Accumulated	
9.2	20	4,383	100.0	410	300	1,356	30.9
13	195	4,363	99.5	630	263	1,056	24.1
20	512	4,168	95.1	970	290	793	18.1
31	431	3,656	83.4	1,500	245	503	11.5
47	372	3,225	73.6	2,300	159	258	5.9
73	377	2,853	65.1	3,600	71	99	2.3
110	403	2,476	56.5	5,500	24	28	.6
170	407	2,073	47.3	8,400	4	4	.1
270	310	1,666	38.0	13,000			.0

Appendix II

Water Quality - St. Joseph River

Approximately One-Half Mile East of Indiana-Ohio State Line
(Raw Laboratory Data from Public Health Service Lake Erie Field Station)

Date	D.O.	% Sat.	B.O.D.	pH	Alk.	NO_3	PO_4	Cl	Coli	Fecal Strep.	Phenols	NH_3
6 /1 /64	7.30	71	2.64	8.2	244	--	--	--	1,400	32	--	--
6 /8 /64	6.12	60	3.70	8.1	276	--	--	--	23,500	29	--	--
6 /15/64	5.93	66	5.01	7.9	246	--	--	--	5,100	21	--	--
6 /22/64	5.50	60	8.41	7.4	143	--	--	15	130,000	3,500	--	--
7 /7 /64	8.14	95	4.42	8.3	237	--	--	--	16,000	7	--	--
7 /14/64	6.90	75	--	8.0	213	--	--	15	31,000	920	--	--
7 /22/64	7.20	89	4.48	8.6	243	--	--	--	--	45	--	--
7 /23/64	--	--	--	--	--	--	--	--	2,600	--	--	--
7 /30/64	6.52	74	--	--	--	--	--	--	1,400	440	--	--
8 /7 /64	8.82	109	7.50	8.5	222	--	--	16	3,900	400	--	--
8 /13/64	6.40	66	4.30	8.4	239	--	--	18	--	--	--	--
8 /19/64	10.10	104	6.60	8.6	220	--	--	--	1,500	900	--	--
8 /25/64	8.10	87	2.90	8.3	198	--	--	--	--	--	--	--
9 / 1/64	6.40	69	2.30	8.2	226	--	--	--	--	--	--	--
9 /9 /64	10.51	121	3.30	8.5	245	--	--	16	--	--	--	--
9 /17/64	8.75	85	5.70	8.4	255	--	--	--	--	--	--	--
9 /21/64	6.78	71	4.50	8.2	225	--	--	--	--	--	--	--
9 /29/64	8.29	75	4.00	8.2	249	--	--	16	--	--	0.0112	--
10/ 5/64	6.60	47	7.30	8.0	255	--	--	17	--	--	0.0007	--
10/15/64	9.31	78	2.00	8.2	269	--	--	14	--	--	0.0090	--
10/19/64	6.70	55	4.10	8.1	267	--	--	14	--	--	0.0039	--
10/27/64	4.10	35	3.10	7.9	280	--	--	15	--	--	0.0032	--
11/ 4 /64	4.10	36	2.30	7.9	272	--	--	15	--	--	0.0095	--
11/13/64	6.71	57	1.70	8.0	277	--	--	15	--	--	0.0093	--
11/16/64	7.80	69	--	8.1	261	--	--	16	--	--	0.0021	--

Appendix II - continued

Date	D.O.	% Sat.	B.O.D.	pH	Alk.	NO_3	PO_4	Cl	Coli	Fecal Strep.	Phenols	NH_3
11/24/64	12.28	84	2.40	8.2	284	--	--	10	--	--	0.0004	—
12/2/64	12.35	84	1.80	7.8	262	--	--	18	—	--	0.0003	—
12/15/64	12.14	85	--	7.7	245	--	--	33	--	--	0.0026	—
1/8/65	11.96	87	--	7.7	--	2.64	--	--	--	--	0.0010	0.56
1/18/65	10.13	69	--	7.5	--	2.10	--	--	--	--	—	0.40
2/4/65	8.88	61	--	7.6	--	--	--	--	--	--	0	—
3/1/65	9.10	64	--	7.8	--	--	--	--	--	--	0.0022	—
3/9/65	11.66	85	--	7.7	--	--	--	--	--	--	0.0035	--

All analyses reported as mg/l except % Sat., pH, Coli, and Fecal Strep.
Coli and Fecal Strep reported as MPN/100 ml.

Appendix III
Municipal Waste Treatment Facilities
Maumee River Basin

Municipality	1960 Population	Treatment	Present Facility Completed	Design Flow MGD	Present Flow MGD	P.E. to Stream*	Receiving Stream St. Joseph Basin	Probable Lowest Stream Flow - cfs 10 yr.-7 day**
Waterloo	1,432	Activated sludge	1962	0.175	0.127	45	Cedar Creek	<1.0
Avilla	919	Lagoon	under constr.	0.220	0.045	45***	Cedar Creek	<1.0
Auburn	6,350	Activated sludge	1940	0.750	2.070	324	Cedar Creek	2.2
Garrett	4,364	Activated sludge	1956	0.800	0.300	270	Garrett Ditch	<1.0
Butler	2,176	Trickling filter	1956	0.300	0.250	660	Big Run Drain	<1.0
Berne	2,644	Lagoon	1964	0.400	0.150	132	Blue Creek	<1.0
Decatur	8,327	Trickling filter	1958	1.800	0.970	624	St. Mary's River	7.9
Fort Wayne	161,776	Activated sludge	1961	32.000	21.290	15,500	Maumee River	50 Est.
New Haven	3,396	Trickling filter	1958	0.750	0.343	460	Maumee River	50 Est.

* Actual Measurements (1 P.E. = 0.167 lbs. BOD_5)

** "Low Flow Characteristics of Indiana Streams"

*** After Completion

Appendix IV

Industrial Waste Treatment and Control Facilities

Maumee River Basin

Industry	Sewage Disposal	Industrial Waste Facilities	Waste Flow MGD	P.E. to Stream	Receiving Stream St. Joseph Basin	Remarks
T-H Products Corporation Waterloo	Oxidation lagoon	Cyanide control and oxidation lagoon	0.0006	-	-	No outlet to stream
Kitchen-Quip, Inc. Waterloo	Waterloo sewer	In-plant control	0.141	55.0	Cedar Creek	
Warner Automative Div. Borg-Warner Corporation Auburn	Auburn sewer	Oily waste storage	0.393	210.0	Cedar Creek	
Auburn Tankage Company Auburn	Septic-absorption system	Grease removal and seepage lagoon	0.032	-	Peckhart Ditch	Intermittent discharge
County Line Cheese Co. Auburn	Septic tank-spray irrigation	Whey dryer, storage lagoon and spray irrigation	-	-	Swartz-Carnahan Ditch	
Crane Edmund Corporation Butler	Septic-absorption system	Cyanide control and static rinse tank	0.064	23.0	Big Run Drain	
Universal Tool and Stamping Co., Inc. Butler	Butler sewer	Cyanide control and static rinse tanks	0.025	26.0	Big Run Drain	
Butler Canning Co., Inc. Butler	Septic-absorption system	Storage lagoon	-	-	Big Run Drain	Controlled discharge
Sechler & Son, Inc. St. Joe	Septic-absorption system	None	0.035	3,000.0	Bear Creek	Lagoon under construction

Appendix IV - continued

Industry	Sewage Disposal	Industrial Waste Facilities	Waste Flow MGD	P.E. to Stream	Receiving Stream St. Joseph Basin	Remarks
Shaw's Dressed Poultry Grabill	Septic-absorption system	Screens, oxidation lagoons and blood collection	-	-	Haifley Ditch	Intermittent discharge
Central Soya Co., Inc. Decatur	Oxidation lagoons	Oxidation lagoons	0.053	25.0	St. Mary's River	
Essex Wire Corporation Fort Wayne	Fort Wayne sewer	Oxidation lagoon	0.088	12.0	St. Mary's River	
Dana Corporation Fort Wayne	Fort Wayne sewer	Oxidation lagoons	1.045	250.0	Neuhaus Ditch	
Franke Plating Works, Inc. Fort Wayne	Fort Wayne sewer	Cyanide control and equalization tank	0.117	45.0	Maumee River via Fort Wayne storm sewer	
International Harvester Co. Fort Wayne	Fort Wayne sewer	Soluble oil flotation	0.300	216.0	Harvester and Meyer Road Ditches	
Gladieux Oil Company Fort Wayne	Septic tanks	Oil separator	0.154	52.0	Harvester Ditch	
Phelps Dodge Corporation Fort Wayne	Fort Wayne sewer	Acid neutralization & sedimentation pond	0.324	103.0	Harvester and Meyer Road Ditches	Company designing additional facilities
Magnavox Company Bueter Road Plant Fort Wayne	Fort Wayne sewer	Cyanide control	-	-	Harvester Ditch	

Appendix IV - continued

Industry	Sewage Disposal	Industrial Waste Facilities	Waste Flow MGD	P.E. to Stream	Receiving Stream St. Joseph Basin	Remarks
I. T. & T. Corporation Federal Laboratories Fort Wayne	Fort Wayne sewer	Cyanide control	-	-	Harvester Ditch	
General Plating & Engineering, Inc. Fort Wayne	Septic-absorption system	Cyanide control and static rinse tanks	0.038	303.0	Meyer Road Ditch	
Parrot Packing Company Fort Wayne	Septic tanks	None	0.106	3,900.0	Maumee River	Will connect to Fort Wayne sewer
B. F. Goodrich Company New Haven	Activated sludge plant	Oil separator	0.263	170.0	Maumee River	

Appendix V

St. Joseph River (Maumee River Basin), Fort Wayne--1964

Station STJ-8*

DATE	LABORATORY ANALYSIS															FIELD TESTS				FLOW
	ALKALINITY (TOTAL) AS CaCO3 MG/LITER	CHLORIDES AS CL- MG/LITER	NITRATES AS N MG/LITER	pH	SPEC. CONDUCTANCE µ MHOS./ 1CM	HARDNESS AS Ca CO3 MG/LITER	COLOR	ODOR-QUALITATIVE	TURBIDITY	SUSP. MATTER MG/LITER	VOL. SUSP. MATTER MG/LITER	PHOSPHATES	A.B.S.	BOD MG/LITER	COLIFORM PER 100 ML.	TEMPERATURE -C°	DISSOLVED OXYGEN MG/LITER	DISSOLVED OXYGEN % SAT.	pH	FLOW CFS.
1 8 64	310	23	.9	7.9	756	374	10	0	305	5	5	24		2.9	120	1	13.6	95	8.0	[illegible]
1 23 64	240	21	1.2	8.2	672	316	30	0	20	4	4	40		5.3	5000	2	11.3	82	8.0	210
2 6 64	210	19	1.2	8.0	655	312	35	0	10	7	4	34		3.0	1500	2	11.8	86	7.4	156
2 19 64	248	24	1.1	8.1	695	330	15	00	5	3	2	2.7		3.4	100	2	18.0	130	7.1	89
3 4 64	253	19	.7	7.9	684	336	15	00	5	7	4	.8		3.5	600	4	16.5	126	•	221
3 18 64	130	21	7.0	7.6	629	358	30	00	30	15	3	.6		3.2	1000	2	8.5	62	•	411
4 1 64	136	16	6.6	7.8	640	326	30	00	40	15	7	.2		3.9	4700	3	11.3	84	•	820
4 15 64	178	17	4.3	7.8	706	350	30	00	60	41	8	.8		3.7	900	14	12.0	116	7.2	492
4 29 64	124	10	4.2	7.6	526	252	5[illegible]	[illegible]0	150	70	23	.8		6.3	13000	14	8.6	83	7.1	2100
5 13 64	214	12	.9	8.0	663	360	25	00	240	202	33	.3		6.3	11000	18	9.9	103	7.2	552
5 27 64	210	14	1.4	7.9	642	328	25	M	130	69	12	.6		3.0	6000	22	6.8	77	•	382
6 11 64	246	13	.7	8.0	729	342	20	00	25	17	4	.7		2.7	1500	23	6.6	76	7.7	119
6 25 64	138	12	8.3	8.0	489	238	60	00	150	100	17	.5		4.0	9000	24	7.0	82	7.1	362
7 8 64	184	16	2.6	7.9	573	310	25	00	20	68	11	1.0		4.7	29000	23	9.6	111	7.8	309
7 23 64	154	20	.1	7.9	528	242	25	DS	15	35	27	.6		5.0	1400	30	14.2	187	7.8	85
8 5 64	236	18	.2	8.0	662	314	25	00	40	28	13	.3		5.0	11000	26	8.0	97	7.8	85
8 19 64	256	12	.4	7.9	674	330	25	00	30	15	7			2.1	100	24	8.9	104	7.4	67
9 3 64	260	18	.3	8.2	647	314	20	E	30	25	6	.4		1.9	200	25	8.6	102	7.9	70
9 16 64	292	19	.1	8.3	642	322	20	00	15	18	5	.3		1.7	300	18	10.8	110	7.9	54
9 21 64	260	25	.3	8.3	662	326	15	00	10	15	8	.9		2.4	300	25	8.5	101	7.8	46
10 7 64	270	16	.2	8.2	43[illegible]	358	15	00	10	14	7	.5		3.4	2300	12	8.1	75	7.8	53
10 21 64	296	20	.0	7.8	674	344	20	00	15	11	6	.4		3.6	400	10	8.7	77	7.6	54
11 4 64	300	26	.1	7.9	735	352	10	00	10	22	6	18		2.3	500	13	6.0	57	7.6	51
11 19 64	306	2[illegible]	.4	8.2	689	358		00	10	8	7	.4		2.4	1700	5	6.8	53	7.3	77
12 3 64	304	2[illegible]	.4	8.4	644	354	15	00		1		.4		4.2	100		13.5	92	7.9	95
12 16 64	300	26	.3	8.2	723	372	15	MM	5	11	9	.4		2.1	200		11.0	75	7.8	156
12 28 64	2[illegible]4	35	.9	7.9	704	352	10	00	5			.6		5.0	<100	3	12.8	95	•	124

* County road bridge (Mayhew Road), 8 miles northeast of Fort Wayne

Summary Water Quality - Maumee River Basin
St. Joseph River - Fort Wayne

Station STJ-8

Date	Alk. (total) as CaCO, mg/1	Chlorides as Cl^- mg/1	Nitrates as N mg/1	pH	Spec. Cond. umhos./1cm	Hardness as $CaCO_3$, mg/1	Color	Turbidity	Susp. Sol. mg/1	Vol. Susp. Sol. mg/1	B.O.D. mg/1	Coliform per 100 ml.	Diss. Oxygen mg/1	Diss. Oxygen % Sat.
Includes portion of 1957														
1958														
Min.	104	7	0.2	7.4	219	160	10	<5	5	2	1.0	73	6.7	73
Max.	294	18	6.0	8.5	807	376	50	350	452	58	11.0	4,600,000	15.2	113
Ave.	205	11	1.8	8.1	553	288	30	84	87	15	3.1	230,000	9.9	92
1959														
Min.	94	3	0.2	7.6	243	130	20	5	5	1	<1.0	930	5.6	73
Max.	262	14	5.2	8.5	663	336	50	330	308	52	8.0	1,200,000	13.7	106
Ave.	189	10	1.6	8.1	502	254	35	69	55	11	2.5	180,000	9.7	84
1960														
Min.	93	6	0.0	7.9	378	153	5	5	1	0	0.4	1,500	6.5	70
Max.	284	18	4.7	8.8	720	360	70	700	308	46	14.0	230,000	19.0	191
Ave.	214	12	1.3	8.3	531	286	30	80	52	10	3.2	37,000	10.6	91
1961														
Min.	96	5	0.0	7.5	424	204	10	10	9	4	0.8	300	6.6	46
Max.	334	19	5.7	8.7	728	372	50	180	136	25	10.0	460,000	23.5	281
Ave.	207	13	1.9	8.1	558	288	30	45	41	10	3.0	82,000	10.2	111

Appendix V - continued

Date	Alk. (total) as CaCO, mg/1	Chlorides as Cl$^-$ mg/1	Nitrates as N mg/1	pH	Spec. Cond. ^{u}mhos./1cm	Hardness as CaCO$_3$, mg/1	Color	Turbidity	Susp. Sol. mg/1	Vol. Susp. Sol. mg/1	B.O.D. mg/1	Coliform per 100 ml.	Diss. Oxygen mg/1	Diss. Oxygen % Sat.
1962														
Min.	90	7	0.1	7.7	297	138	10	5	9	0	1.3	100	6.5	63
Max.	313	28	4.2	8.6	931	360	50	120	104	32	8.7	230,000	19.0	223
Ave.	235	14	0.8	8.2	600	297	20	35	34	12	4.1	23,000	9.9	96
1963														
Min.	72	10	0.0	7.2	342	142	5	5	4	4	1.7	100	6.8	66
Max.	304	18	4.5	8.5	706	384	50	100	123	38	10.0	23,000	14.3	138
Ave.	217	16	1.3	8.0	597	308	25	30	33	11	3.8	4,100	9.4	88
1964														
Min.	124	10	0.0	7.6	430	238	10	5	1	0	1.7	100	6.0	53
Max.	310	35	8.3	8.4	756	374	60	305	202	33	6.3	29,000	18.0	187
Ave.	244	19	1.7	8.0	645	329	25	55	32	9	3.3	3,500	10.3	94

Appendix VI
Water Quality - St. Mary's River
Indiana Highway 101
Approximately Two Miles West of Indiana-Ohio State Line
(Raw Data from Public Health Service Lake Erie Field Station)

Date	D.O.	% Sat.	B.O.D.	pH	Alk.	NO_3	PO_4	Cl	Coli	Fecal Strep.	Phenols	NH_3
6/2/64	11.30	111	7.30	8.7	214	--	--	--	8,000	36	--	--
6/6/64	--	--	--	--	--	--	--	--	47,000	--	--	--
6/9/64	9.60	111	6.93	8.4	234	--	--	--	--	1,600	--	--
6/16/64	6.37	69	4.16	7.8	155	--	--	--	--	--	--	--
6/23/64	6.05	73	--	--	--	--	--	--	6,000	125	--	--
7/8/64	6.27	71	7.10	7.9	158	--	--	--	132,000	8	--	--
7/16/64	6.83	78	3.86	8.2	148	--	--	--	--	--	--	--
7/20/64	15.50	204	10.71	9.0	142	--	--	--	--	250	--	--
7/21/64	--	--	--	--	--	--	--	--	3,600	--	--	--
8/2/64	4.88	61	6.52	8.3	175	--	--	33	13,000	1,500	--	--
8/4/64	7.91	102	8.29	8.7	212	--	--	--	10,000	3,400	--	--
8/10/64	6.10	66	4.00	8.5	224	--	--	--	3,000	800	--	--
8/21/64	5.43	60	9.56	8.2	206	--	--	--	120,000	4,600	--	--
8/25/64	7.31	82	6.70	8.3	179	--	--	--	--	4,400	--	--
8/26/64	--	--	--	--	--	--	--	--	33,000	--	--	--
9/1/64	5.70	66	6.10	8.2	202	--	--	--	21,000	3,300	--	--
9/9/64	8.84	103	16.90	8.5	201	--	--	50	30,000	3,300	--	--
9/17/64	6.94	--	7.20	8.2	206	--	--	--	11,000	9,000	--	--
9/21/64	8.51	97	7.50	8.0	183	--	--	--	14,000	1,500	--	--
9/29/64	8.65	86	6.00	8.2	186	--	--	44	8,600	600	0.0050	--
10/5/64	9.01	85	6.40	8.3	184	--	--	--	21,000	1,500	0.0026	--
10/15/64	9.71	94	7.50	8.4	191	--	--	--	4,000	600	0.0072	--
10/19/64	8.00	--	5.60	8.1	206	--	--	--	22,000	900	0.0036	--
10/27/64	7.71	75	9.60	8.0	220	--	--	--	4,000	500	--	--
11/4/64	2.38	27	7.00	7.7	202	--	--	47	6,200	1,700	0.0089	--

Appendix VI - continued

Date	D.O.	% Sat.	B.O.D.	pH	Alk.	NO_3	PO_4	Cl	Coli	Fecal Strep.	Phenols	NH_3
11/13/64	6.51	58	6.70	7.9	213	--	--	36	4,500	1,300	0.0068	--
11/16/64	6.00	58	--	8.3	210	--	--	42	59,000	8,900	0.0025	--
11/24/64	10.10	73	2.30	8.0	231	--	--	44	9,400	6,300	0.0010	--
12/ 2 /64	11.21	81	--	7.9	193	--	--	29	11,000	2,200	0.0024	--
12/15/64	11.42	80	--	7.4	192	--	--	39	6,200	3,700	0.0011	--
1 /8 /65	9.78	84	--	7.7	--	2.20	--	--	--	--	0.0002	1.28
1/ 18/65	10.69	75	--	7.6	--	1.80	--	--	--	--	--	3.04
2 /4 /65	7.25	50	--	7.6	--	--	--	--	--	--	0.0006	--
3 /1 / 65	10.10	71	--	7.7	--	--	--	--	--	--	0.0028	--
3 /9 /65	11.29	84	--	7.7	--	--	--	--	--	--	0.0046	--

All analyses reported as mg/l except % Sat., pH, Coli, and Fecal Strep.
Coli and Fecal Strep. reported as MPN/100 ml.

Appendix VII

St. Mary's River (Maumee River Basin), Fort Wayne -- 1964 Station STM-12*

DATE	LABORATORY ANALYSIS															FIELD TESTS				FLOW
																	DISSOLVED OXYGEN			
	ALKALINITY (TOTAL) AS CaCO3 MG/LITER	CHLORIDES AS CL- MG/LITER	NITRATES AS N MG/LITER	pH	SPEC. CONDUCTANCE µ MHOS./ 1CM	HARDNESS AS Ca CO3 MG/LITER	COLOR	ODOR-QUALITATIVE	TURBIDITY	SUSP. MATTER MG/LITER	VOL. SUSP. MATTER MG/LITER	PHOSPHATES	A.B.S.	BOD MG/LITER	COLIFORM PER 100 ML.	TEMPERATURE - C°	MG/LITER	% SAT.	pH	FLOW CFS.
1 9 64	228	55	.5	7.6	1324	424	30	0	10	10	6	30		3.3	8800		8.0	55	.	28
1 22 64	177	89	1.1	8.0	1007	334	25	0	10	7	3	39		4.0	48000		5.7	39	7.5	118
2 5 64	146	73	1.0	7.9	885	306			5	5	4	45		2.6	1700	1	11.6	81	7.2	55
2 19 64	RIVER FROZEN																			
3 4 64	76	25	3.7	7.4	413	178	50	00	280	158	25	1.2		9.0	75000	1	11.0	77	.	735
3 18 64	82	17	7.8	8.0	416	188	25	00	80	34	6	.7		3.0	3000	5	6.5	52	.	2420
4 1 64	134	26	4.4	7.9	640	306	10	00	25	17	5	.4		2.4	4400	4	11.1	85	.	350
4 15 64	122	18	5.2	7.8	572	162	25	00	100	61	15	.8		2.5	2900	13	8.7	83	7.3	515
4 29 64	66	8	3.4	7.3	363	158	50	00	180	69	13	.6		3.8	11000	14	7.9	76	7.2	3220
5 13 64	154	24	.9	8.0	674	302	25	E	80	36	17	.1		[redacted]	4000	18	10.2	104	7.2	182
5 28 64	92	11	9.2	7.6	359	172	30	00		690	70	.2		2.8	320000	18	6.5	68	7.2	700
6 10 64	142	27	2.9	7.9	931	258	25	E	210	89	5	.5		2.8	3800	25	7.5	90	7.2	68
6 24 64	156	31	4.6	7.9	701	308	30	00	200	135	18	.5		2.7	2100	25	5.6	67	7.2	210
7 9 64	194	69	2.5	8.2	835	350	10	00	10	50	14	2.0		5.9	1600	25	11.0	131	8.4	112
7 22 64	176	64	.9	8.0	793	324	30	DS	100	21	7	.5		4.7	1000	31	13.5	180	8.8	28
8 6 64	172	66	.3	7.9	1059	310	30	DS	100	66	16	.4		2.7	1700	28	6.8	86	7.8	17
8 20 64	226	108	.3	8.2	995	394	50	00	100	64	17			6.0	3000	24	9.5	112	8.0	17
9 3 64	234	88	.2	8.0	1055	420	25	00	100	79	18	.8		3.0	200	24	7.3	86	7.8	16
9 17 64	258	114	.2	8.2	1115	450	20	00	70	60	14	.7		3.9	4000	19	9.2	98	7.8	11
9 21 64	222	125	.0	8.1	1177	442	20	E	50	53	16	.8		5.1	900	25	11.7	139	7.9	22
10 7 64	226	97	.1	8.2	731	418	25	00	80	56	21	.8		8.2	1300	13	8.0	76	7.8	18
10 21 64	254	96	.6	7.7	1306	572	20	00	60	32	11	.8		4.6	2100	13	7.0	66	7.5	16
11 4 64	248	122	.5	7.5	133	450	25	00	60	51	12	2.0		5.4	1000	13	4.0	38	7.4	10
11 18 64	240	118	.5	8.0	1260	480		00	30	27	9	1.5		3.7	1300	8	5.7	48	7.6	22
12 3 64	RIVER FROZEN																			
12 16 64	RIVER FROZEN																			
12 29 64	148	102	.7	7.8	1022	352	15	00	20			1.9		5.9	2600	2	9.3	67	7.6	27

* County road bridge (Anthony Boulevard), 4 miles south of Fort Wayne

Appendix VII - continued

Summary Water Quality - Maumee River Basin
St. Mary's River - Fort Wayne

Station STM - 12

Date	Alk. (total) as CaCO, mg/1	Chlorides as Cl^- mg/1	Nitrates as N mg/1	pH	Spec. Cond. μmhos./1cm	Hardness as $CaCO_3$, mg/1	Color	Turbidity	Susp. Sol. mg/1	Vol. Susp. Sol. mg/1	B.O.D. mg/1	Coliform per 100 ml.	Diss. Oxygen mg/1	Diss. Oxygen % Sat.
Includes portion of 1957														
1958														
Min.	60	6	0.0	7.2	233	104	15	<5	7	2	1.3	36	4.7	51
Max.	290	97	9.4	9.0	1,212	454	50	750	584	118	8.0	1,100,000	16.5	146
Ave.	166	24	2.0	8.0	576	272	30	137	124	21	3.4	134,000	9.3	64
1959														
Min.	36	4	0.2	7.7	146	56	15	7	9	1	<1.0	360	4.9	59
Max.	226	167	6.2	8.6	1,440	440	40	600	664	100	18.0	1,100,000	16.0	181
Ave.	156	36	2.3	8.1	636	270	25	161	150	22	3.3	170,000	9.8	90
1960														
Min.	104	8	0.2	7.8	401	208	10	5	0	0	0.9	1,500	4.5	56
Max.	274	153	7.9	8.9	1,563	551	50	500	618	95	10.0	930,000	15.0	186
Ave.	192	57	2.5	8.3	857	348	30	95	117	19	6.0	150,000	9.6	95
1961														
Min.	74	7	0.2	7.5	308	144	10	5	5	0	1.6	230	5.0	56
Max.	274	135	6.8	8.5	1,595	536	50	460	329	50	9.1	430,000	16.0	186
Ave.	174	45	2.2	7.9	716	303	25	80	69	14	3.6	62,000	9.6	87

Appendix VII - continued

Date	Alk. (total) as CaCO, mg/1	Chlorides as Cl^- mg/1	Nitrates as N mg/1	pH	Spec. Cond. mhos./1cm	Hardness as $CaCO_3$, mg/1	Color	Turbidity	Susp. Sol. mg/1	Vol. Susp. Sol. mg/1	B.O.D. mg/1	Coliform per 100 ml.	Diss. Oxygen mg/1	Diss. Oxygen % Sat.
1962														
Min.	76	9	0.1	7.7	326	158	5	10	16	3	2.1	100	4.8	53
Max.	238	147	3.6	9.0	1,412	496	30	500	614	68	11.0	370,000	16.0	157
Ave.	184	68	1.6	8.1	811	337	20	90	103	23	5.6	35,000	9.5	96
1963														
Min.	30	6	0.1	7.0	164	58	15	<5	7	4	1.6	100	5.6	49
Max.	296	190	8.2	8.7	1,765	510	60	100	116	38	12.0	12,000	22.1	218
Ave.	193	92	2.1	8.0	1,007	366	30	50	46	16	6.1	2,300	10.3	98
1964														
Min.	76	8	0.0	7.3	133	158	10	5	7	3	2.4	200	4.0	38
Max.	258	125	9.2	8.2	1,324	572	50	280	690	70	9.0	320,000	13.5	180
Ave.	174	66	2.1	7.9	824	358	25	80	77	14	4.3	23,000	8.5	83

Appendix VIII

Maumee River, New Haven--1964

Station M-110*

	LABORATORY ANALYSIS															FIELD TESTS				FLOW
																	DISSOLVED OXYGEN			
DATE	ALKALINITY (TOTAL) AS $CaCO_3$ MG/LITER	CHLORIDES AS CL- MG/LITER	NITRATES AS N MG/LITER	pH	SPEC. CONDUCTANCE µ MHOS./ 1CM	HARDNESS AS $CaCO_3$ MG/LITER	COLOR	ODOR-QUALITATIVE	TURBIDITY	SUSP. MATTER MG/LITER	VOL. SUSP. MATTER MG/LITER	PHOSPHATES	A.B.S.	BOD MG/LITER	COLIFORM PER 100 ML.	TEMPERATURE - C°	MG/LITER	% SAT.	pH	FLOW CFS.
1 9 64	226	73	.6	7.7	847	354	30	0	170	180	74	25		48.0	1500000	5	6.6	52	.	559
1 22 64	256	58	1.2	8.0	904	400	25	0	20	16	8	20		9.5	64000	4	10.3	78	7.4	348
2 5 64	184	51	2.2	7.8	779	282	30	0	10	10	7	7A		6.1	640000	5	9.3	72	7.2	159
2 19 64	222	87	1.8	7.8	982	314	25	00	10	4	3	7.5		4.6	49000	6	11.0	88	7.2	142
3 5 64	152	37	2.7	8.3	568	252	25	00	390	218	50	1.2		19.0	210000	3	10.3	76	.	2310
3 18 64	88	18	7.0	7.6	439	206	30	00	90	40	8	.6		2.6	40000	5	7.8	161	.	3460
4 1 64	138	22	6.0	7.9	640	324	25	00	40	15	5	.5		3.7	12000	4	11.7	89	.	1400
4 15 64	144	20	4.7	7.7	652	296	25	00	90	44	10	1.0		3.9	700	13	9.1	86	7.3	1270
4 29 64	106	9	3.7	7.4	421	206	50	00	220	123	23	.7		5.0	25000	14	8.7	84	7.2	6350
5 13 64	170	25	1.2	7.5	695	318	25	E	80	32	14	.5		42.0	590000	19	7.1	76	7.2	951
5 28 64	114	13	6.8	7.7	415	208	30	00		478	48	.9		4.2	420000	20	6.1	66	.	1500
6 11 64	200	40	.8	7.7	931	316	25	00	15	17	6	4.2		4.0	500000	23	2.1	24	7.2	231
6 24 64	174	14	4.6	7.9	526	256	35	00	400	260	25	.9		4.3	90000	26	5.0	61	7.1	1200
7 9 64	178	28	2.6	7.9	606	262	20	00	10	23	6	23		4.5	210000	24	3.4	40	7.7	419
7 23 64	192	43	.0	7.7	793	278	40	E	15	42	15	9.0		9.3	270000	28	.0		7.5	158
8 5 64	158	45	.1	7.6	814	240	50	CH	10	6	6	8.0		3.0	27000	28	4.4	56	7.6	106
8 20 64	228	60	.3	7.7	836	306	40	CH	15	6	6			6.7	110000	29	2.3	30	7.2	102
9 3 64	232	51	.8	7.7	802	308	30	A	10	9	6			5.0	69000	25	3.0	36	7.3	110
9 17 64	250	56	.1	7.9	784	304	30	M	30	14	9			8.3	2100000	20	.0		7.5	78
9 21 64	238	5[illegible]	.0	7.9	883	320	25	00	10	12	10	8.0		8.3	1000000	25	2.3	28	7.4	142
10 7 64	240	68	.3	8.1	604	322	25	00	15	12	8			14.0	4500000	16	2.3	23	8.4	88
10 22 64	248	66	.9	7.5	950	320	30	00	10	17	13			3.8	510000	13	3.4	32	7.2	65
11 4 64	260	60	.8	7.6	926	316	20	00	10	11	5			3.6	110000	16	1.7	17	6.8	70
11 19 64	252	62	.3	8.0	908	370		00	5	6	5	2.0		3.9	1000000	9	3.5	31	7.5	101
12 3 64	282	55	.3	8.1	810	350	25	00	5	4	1	3.0		2.4	1500000	2	4.1	30	7.6	116
~~12 16 64~~	~~246~~	~~73~~	~~.5~~	~~8.1~~	~~943~~	~~354~~	~~15~~	~~MM~~	~~10~~	~~10~~	~~10~~	~~3.7~~		~~5.4~~	~~590000~~	~~4~~	~~4.5~~	~~35~~	~~7.5~~	~~172~~
12 28 64	248	63	1.0	7.8	894	374	10	00	10			6.5		7.3	150000	5	6.4	50	.	150

* County road bridge (Landin Road), 0.5 miles north of New Haven

Summary Water Quality - Maumee River Basin
Maumee River - New Haven

Station M-110

Dete	Alk. (total) as CaCO, mg/1	Chlorides as Cl⁻ mg/1	Nitrates as N mg/1	pH	Spec. Cond. μmhos./1cm	Hardness as $CaCO_3$, mg/1	Color	Turbidity	Susp. Sol. mg/1	Vol. Susp. Sol. mg/1	B.O.D. mg/1	Coliform per 100 ml.	Diss. Oxygen mg/1	Diss. Oxygen % Sat.
Includes portion of 1957														
1958														
Min.	94	7	0.1	7.2	290	120	15	5	8	2	1.0	7,500	2.1	25
Max.	286	50	6.8	8.4	896	396	70	400	470	40	11.0	7,500,000	14.8	124
Ave.	184	16	2.3	8.0	558	273	35	105	92	16	3.9	415,000	8.6	80
1959														
Min.	58	6	0.6	6.8	124	26	15	10	17	5	1.0	910	3.6	44
Max.	258	46	5.4	8.4	771	380	58	550	500	88	5.6	2,300,000	13.5	103
Ave.	173	18	2.1	7.9	516	249	35	113	102	20	2.8	470,000	8.0	70
1960														
Min.	106	9	0.4	7.8	359	172	10	5	7	0	2.5	4,300	3.3	31
Max.	278	65	4.6	8.6	979	384	45	600	480	64	20.0	9,300,000	15.0	105
Ave.	208	25	1.9	8.1	645	304	30	69	78	16	5.5	980,000	7.5	66
1961														
Min.	96	8	0.4	7.5	363	182	5	5	9	2	1.7	43,000	1.6	19
Max.	320	50	5.8	8.2	979	420	50	180	147	56	9.9	2,400,000	17.5	195
Ave.	201	25	1.9	7.9	631	300	30	60	53	14	4.8	550,000	8.3	71

Appendix VIII - continued

Date	Alk. (total) as CaCO, mg/1	Chlorides as Cl^- mg/1	Nitrates as N mg/1	pH	Spec. Cond. ^{u}mhos./1cm	Hardness as $CaCO_3$, mg/1	Color	Turbidity	Susp. Sol. mg/1	Vol. Susp. Sol. mg/1	B.O.D. mg/1	Coliform per 100 ml.	Diss. Oxygen mg/1	Diss. Oxygen % Sat.
1962														
Min.	96	11	0.1	7.5	370	162	10	5	11	1	2.1	100	2.5	25
Max.	254	65	4.8	8.4	921	368	50	170	120	32	6.9	890,000	12.5	87
Ave.	177	34	1.6	8.0	675	281	30	45	43	14	4.7	110,000	7.6	68
1963														
Min.	56	8	0.4	7.5	250	104	10	5	6	0	3.3	4,500	2.1	24
Max.	315	215	6.3	8.4	1,363	406	60	110	220	68	17.0	590,000	13.9	137
Ave.	212	52	2.4	7.8	766	306	30	30	36	13	6.6	100,000	7.8	71
1964														
Min.	88	9	0.0	7.4	415	206	10	5	4	1	2.6	700	0.0	0
Max.	282	87	7.0	8.3	982	400	50	400	478	74	48.0	4,500,000	11.7	161
Ave.	201	46	1.9	7.8	750	303	30	60	59	14	8.9	603,000	5.5	53

Appendix IX
Water Quality - Maumee River Near Woodburn, Indiana
Indiana Highway 101
5.5 Miles West of Indiana-Ohio State Line
(Unpublished Data from Indiana State Board of Health)

Date	D.O.	% Sat.	B.O.D.	pH	Alk.	NO_3	PO_4	Cl	Coli	Fecal Strep.	Phenol	NH_3	CN	Cu
8/15/63	9.3	102	5.3	8.2	180	--	--	39	26,000	--	--	--	--	--
4/1/64	8.7	83	3.7	8.3	160	4.0	1.2	21	7,000	--	--	--	--	--
4/29/64	8.5	82	3.8	7.5	104	3.7	0.8	10	36,000	--	--	--	--	--
5/13/64	7.9	85	7.3	7.9	176	1.1	1.1	24	22,000	--	--	--	--	--
5/28/64	5.1	56	5.3	7.6	118	6.8	0.7	14	450,000	--	--	--	--	--
*6/8/64	--	--	--	--	--	--	--	--	3,200	--	--	--	--	--
6/11/64	4.5	54	8.0	7.6	202	1.1	11.0	39	700,000	3,200	--	--	--	--
*6/15/64	--	--	--	--	--	--	--	--	28,600	182	--	--	--	--
*6/22/64	--	--	--	--	--	--	--	--	15,000	112	--	--	--	--
6/24/64	4.8	59	4.3	7.9	178	3.6	0.9	15	80,000	--	--	--	--	--
*7/7/64	--	--	--	--	--	--	--	--	240,000	1,300	--	--	--	--
7/9/64	3.8	44	4.1	7.8	170	2.2	2.3	34	88,000	--	--	--	--	--
7/16/64	8.5	102	5.9	7.7	192	--	--	38	36,000	--	--	--	--	--
*7/22/64	--	--	--	--	--	--	--	--	2,200	375	--	--	--	--
7/23/64	6.0	77	3.7	8.1	206	2.4	8.0	43	7,000	--	--	--	--	--
*8/1/64	--	--	--	--	--	--	--	--	1,500	1,300	--	--	--	--
*8/3/64	--	--	--	--	--	--	--	--	3,900	4,500	--	--	--	--
*8/14/64	--	--	--	--	--	--	--	--	9,100	5,300	--	--	--	--
8/20/64	8.2	96	8.0	7.9	212	2.0	10.0	60	<10,000	--	--	--	--	--
*8/20/64	--	--	--	--	--	--	--	--	1,600	6,100	--	--	--	--
9/5/64	7.0	85	6.0	7.7	208	2.1	13.0	50	700	--	--	--	--	--
9/17/64	6.4	67	8.3	8.2	240	1.0	13.0	55	19,000	--	--	--	--	--
9/21/64	11.0	134	4.0	7.8	210	0.2	14.0	54	100,000	--	--	--	--	--
10/2/64	5.6	54	4.3	7.9	222	1.4	10.0	63	18,000	--	--	--	--	--
10/22/64	3.7	33	4.8	7.5	254	2.6	10.0	67	20,000	--	--	--	--	--

* Auxiliary Data by Public Health Service Lake Erie Field Station

Appendix IX - continued

Date	D.O.	& Sat.	B.O.D.	pH	Alk.	NC_3	PO_4	Cl	Coli	Fecal Strep.	Phenol	NH_3	CN	Cu
11/4/64	4.4	43	4.8	7.5	266	0.8	28.0	55	600	--	--	--	--	--
11/19/64	3.9	32	4.1	8.0	234	0.5	3.2	55	450,000	--	--	--	--	--
12/3/64	8.1	56	2.2	8.3	258	1.6	2.1	61	20,000	--	--	--	--	--
12/16/64	10.0	68	1.7	8.1	242	1.0	3.2	74	9,800	--	--	--	--	--
12/30/64	8.9	66	5.2	7.9	250	1.4	2.8	55	12,000	--	--	--	--	--
1/13/65	10.1	69	6.3	8.2	168	6.0	1.7	39	29,000	--	--	--	--	--
1/26/65	10.7	77	5.0	7.6	98	5.9	0.6	23	92,000	--	--	--	--	--
2/10/65	7.0	56	--	8.5	248	2.9	0.5	13	20,000	--	--	--	--	--
2/24/65	F R O Z E N		--	7.8	154	5.1	1.2	25	Not Done	--	--	--	--	--
3/10/65	8.8	61	2.4	7.9	76	4.9	0.1	14	31,000	--	--	--	--	--
3/22/65	20.1	144	3.0	8.1	127	5.3	0.4	21	7,700	--	--	--	--	--
4/7/65	10.3	87	3.9	7.9	92	4.8	0.4	11	61,000	--	--	--	--	--
4/21/65	10.0	92	2.7	8.2	148	4.4	0.6	18	35,000	--	--	--	0.9	--
5/3/65	5.8	58	3.7	8.3	150	4.2	0.8	18	12,000	--	--	--	--	--
5/19/65	7.7	89	5.1	8.2	222	2.0	1.9	27	38,000	--	0	--	< 0.15	0.51
6/4/65	5.7	58	3.7	7.6	198	3.7	1.4	26	77,000	--	--	--	< 0.15	--
6/16/65	11.0	122	6.4	8.0	212	2.5	2.4	32	33,000	--	0.013	--	0.15	--

All analyses reported as mg/1 except % Sat., pH, Coli, and Fecal Strep.
Coli and Fecal Strep. reported as MPN/100 ml.

MR. STEIN: Are there any comments or questions?

(No response.)

MR. STEIN: You know, Mr. Miller, I agree with you on the last conclusion, for the purposes of the conference that the Indiana Stream Pollution Control Law is adequate to achieve the desired water quality, but I would not want to leave the impression that it can't be improved.

MR. POOLE: You mean the law or the quality?

MR. STEIN: Both.

MR. POOLE: Thank you. Both.

MR. STEIN: Are there any questions or comments?

(No response.)

MR. STEIN: If not, Mr. Miller, I want to compliment you on certainly a complete and precise report. Particularly, I would like to express my appreciation, and I am sure the appreciation of the Federal Government conferee, for your giving a full and detailed description, name by name, of municipal and industrial plants and their effluents, described in terms of quantity and quality. I think that that helps very much, Mr. Miller.

MR. MILLER: Thank you, Mr. Chairman.

MR. STEIN: If there are no further comments or questions, our present plans are to proceed, after a short recess, with Ohio's presentation until 5:30.

At this time, we will stand recessed for ten minutes.

(After a short recess.)

MR. STEIN: May we reconvene?

It is now about 3:30. We expect to run until 5:30. Ohio will manage its own time, and call the people who desire to participate. We would recommend that if, at any time, you want to finish at or before 5:30, we would be agreeable. Just give us the signal. We are asking you to try to stay as close to that adjournment time as possible, because our critical man is the reporter, and there comes a time when it gets a little difficult for him to take the transcript.

With that, Dr. Arnold, would you take over for Ohio, please?